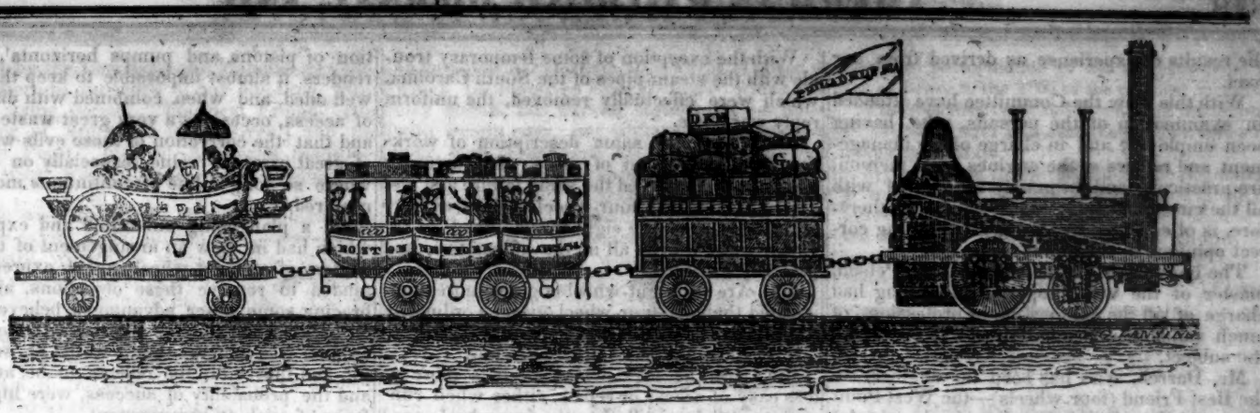

AMERICAN RAILROAD JOURNAL,
AND ADVOCATE OF INTERNAL IMPROVEMENTS.

PUBLISHED WEEKLY, AT No. 35 WALL STREET, NEW-YORK, AT THREE DOLLARS PER ANNUM, PAYABLE IN ADVANCE.

D. K. MINOR, Editor.] SATURDAY, DECEMBER 28, 1833. [VOLUME II.—No. 52.

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AMERICAN RAILROAD JOURNAL, &c.

NEW-YORK, DECEMBER 28, 1833.

With this number, closes the second year of the publication of the Railroad Journal; and although the high hopes and expectations which were entertained by its projector and publisher, have not been fully realized, in the extent of its circulation, yet, it is believed that it has been of some service to the cause in which it embarked, and to which it has been steadily devoted. In a previous number, it was intimated that, in consequence of a want of patronage to sustain it in its present form and size, it might be either continued in a cheaper form, or discontinued with the present number; but, from the prompt subscription of several of its earliest and most constant friends, and assurances from others, that they *would* subscribe, for *additional* volumes from its commencement, as well as use their influence to extend its circulation, I am highly gratified to be able to say, that the Railroad Journal will be continued, and not only continued, but materially improved in its appearance and contents. The two years which have elapsed since its commencement have enabled me to provide foreign publications, from which to select ample and interesting materials, as well as to enlist many able and scientific correspondents of our own country, in its service, which cannot fail to render it hereafter much more valuable than it has hitherto been, to those who honor it with their patronage.

Having, after mature deliberation, resolved to *continue* its publication in its present form of a weekly journal, and also to increase the quantity of its scientific reading, to the exclusion of a part of the news of the day, &c., it is confidently hoped that the improvements which have already been made in its appearance since its commencement, together with a positive assurance that it *will be continued*, at least another year, will be a sufficient guarantee to its subscribers and the public, for *payment in advance* for the ensuing volume. A moment's reflection will be sufficient to convince any person, that such a course *only* will enable me to do them justice. They will readily see that, without such a rule, I must be a loser of *hundreds*, by scattering a thousand small accounts from Maine to Louisiana, whereas, even if by any event its publication should cease, they would not, at most, lose more than two or three dollars, and not even that, as they know where to find me, and could request some friend to call and receive the balance due them. Of that, however, they need not fear, as, when the volume is commenced, they may rest assured that it will be completed.

It is, therefore, *confidently anticipated that every subscriber will remit for the ensuing year, on the receipt of the first number*; and by doing so they will contribute, in no small degree, to the success of a work which, thus far, it may be truly said, and without arrogance, too, has contributed more to *public* than to *private* interest.

The ensuing, as the past volume, will be issued once a week, *except to such as prefer to pay four dollars, and have it put up like this in semi-monthly or in monthly parts, with a cover.*

This number of the Journal contains several highly interesting and important articles; among them will be found a description, with engravings, of Mr. Burden's boat, an invention which promises, as we have been informed by those who have examined it, the most important results in steamboat navigation; also, an interesting description, with engravings, of the *Suspension* Railway, invented by Henry Sargent, Esq., which have been furnished us by an intelligent friend at Boston. It affords us pleasure to be able to close the year and the volume with a number containing so much of interest, and we do not hesitate to promise that the ensuing volume will be far more valuable than either of the preceding.

Report of the Committee on Cars, to the Direction of the South Carolina Canal and Railroad Company, submitted 20th November, 1833.

(Concluded from page 805.)

We are deprived of the use of the West-Point by necessity of new arrangement and frames. S. Carolina, by necessity of new frame and perfecting boiler. Barnwell, by replacing flues burned by accident. We hope to add the Hamburgh in a few days for the transportation of freight at slow speeds.

To the 5th. The West-Point and Hamburgh have been constructed on the plan of the English engines. The performance of the first has been one-third to one-half of those of the eight-wheel engines. It is believed that the Hamburgh is capable of performing one-third more than any of the eight-wheel engines. The operation of both these engines has been very severe on the road, and every engineer, as well as the persons in the charge of the road, unite in the opinion that it would be highly injudicious to use such engines.

To the 6th. The eight-wheel engines differ from the English engines in plan of boiler, manner, and number of supports, arrangement and application of the power, and in the attainment of an equal distribution of the weight; it has been in parts which are common to the two engines, and which are under similar circumstances, that all our trouble has been experienced, and in the *supposed* improvement, that we have obtained an engine possessing very important advantages, and in the use of which every engineer on the road has become their decided advocate, as will appear more fully from other documents herewith communicated.

The Committee, having concurred with the chief engineer in the opinion that mere answers to the above queries would not fully embrace what is evidently the object of their being made, authorised, at his request, an examination into

the results of experience as derived from our road.

With this view the Committee have attended an examination of the persons, who, having been employed, and in charge of the management and repairs of the engines used thereon, are practically and intimately acquainted with all the circumstances: their experience, therefore, is of essential importance in forming correct opinions in relation to them.

The individuals examined were, Mr. Petsch, master of the workshops, who, having had charge of all the engines, is, in profession, of much valuable information and experience on the subject.

Mr. Darrell, who has been the engineer of the Best Friend (four-wheels)—the West Point (four-wheels)—South Carolina (eight-wheels) and Charleston (eight-wheels)—and has occasionally run all the others. Mr. M'Candish, who was the engineer of the Barnwell, and who has run the Charleston. Mr. Robertson, who has had long experience with the four-wheeled engines on the Liverpool and Manchester road, and brings recommendation of the first character from the engineer of that work, and was sent to this country with one of Mr. Stephenson's engines. On our road he has run the Charleston, eight wheels, and Phœnix, four wheels, and occasionally the other engines. Mr. Cummings, who for eighteen months run four-wheel engines on the Liverpool and Manchester road, has run a four-wheel engine on Camden and Amboy road, and a six-wheel engine on the Susquehanna Road. On this road he has run the Charleston and Hamburg.

Mr. Allison, who has been the engineer of the West Point and Edisto, and has run the others, not being in town, the statements were submitted to him and fully concurred in. Mr. Raworth, who has been engineer of the Phœnix, and made a few trips on the other engines, was also absent on the road, but expresses his accordance with the statements made.

The following is an abstract of the testimony brought before the Committee:—

1st As to the expediency or necessity of attempting to run eight-wheel engines. Were there any circumstances which renders it practically necessary or expedient to introduce them? If so, what are they? and has experience on our own or other roads, confirmed or fulfilled the views which led to that measure.

Mr. Petsch, Mr. Darrell, and Mr. Allison, are the only persons of those named who have practical acquaintance with the circumstances at the time, and they unite in the opinion that such circumstance did exist, and that it was highly important that something should be done in consequence of them; that the circumstances were the severe effect of the four-wheeled engines on the road; and the experience of all the persons, either as derived from our own or other roads, confirm most fully the views which led to the introduction of the eight-wheel arrangements.

2d. As to the propriety of postponing orders for English engines. Did or did not a practical consideration of the same circumstances render it injudicious to use four-wheel engines of the usual English construction at that time?

As far as their experience bears on this question, it confirms the views of inexpediency of using such engines at all.

3d. As to the attainment on the eight-wheel engines of the object aimed at, have the eight-wheel engines been successful or otherwise in meeting the difficulty anticipated, and in possessing the qualities for which they were attempted?

The testimony is unanimous and decidedly in the affirmative, showing that extraordinary ease of motion has been attained, such as has never been approached in a four-wheel engine, and that the result is of high practical value to the Company.

4th. Are any, and if so, what of the difficulties which have attended the use of eight-wheel engines, to be attributed to them as *eight-wheel engines*?

With the exception of some temporary trouble with the steam-pipes of the South Carolina, which were effectually removed, the uniform reply was, *none*.

5th. Would the same description of workmanship, proportion of parts, and arrangements, have produced the same failure and disappointments with four-wheel engines, as have taken place with the eight-wheel ones?

The reply was by all in the affirmative, and probably greater.

6th. Are the eight-wheel engines more complicated than the four-wheel ones, as ordinarily constructed?

The statement is, that they are not.

7th. Are the eight-wheel engines more or less easy of access or repair, either when running or standing still, than the four wheel ones?

They are much more easy of access and repair in both cases.

8th. What has been the causes of failure and difficulties?

They have been independent of the principle of an eight-wheeled engine, and have originated in unsound materials, imperfect workmanship, and especially from the inadequate proportion of the working gearing to the strain which they were fairly and necessarily subjected to. In the three eight-wheeled engines last put on the road, double valves, similar to those employed on most of the engines on the Liverpool and Manchester road, were used, the resistance from these valves, with the pressure of steam which our engines work with, has been too great for the valve gearing attached to them. With these engines there has also been much trouble from the imperfect operation of the pumps, partly attributed to bad workmanship, partly to inattention to keep them in thorough working order, partly from being compelled to use the engines, with the pumps not in good order, or only one pump, and partly from the necessity of using water when the wells were low, containing much sediment. A large portion of the continued difficulty has been occasioned by being compelled to run the engines with an imperfect repair, instead of thoroughly correcting the cause of failure; from the exhibit of the engines on the road at sundry periods, it will be apparent how inadequate from causes entirely independent of principle or plan, and of our control, have been the number of engines on the road, to the demands made on them, and consequently it is evident why it has been found necessary, rather repeatedly to repair them than to remove thoroughly the cause of failure, the latter would have required time, which our engagements would not allow, and rendered immediate repair and use essential; to these causes must necessarily be added, those existing in mismanagement, inattention, extraordinary strains from wrong position of gates and crossing rails, injudicious speeds and similar sources not easily provided against, especially under our peculiar circumstances, and with new machinery and men inexperienced in its management.

9th. As to the effect which experience has had on the original and present operation as to the eight-wheeled engines of the persons examined.

They were all originally unfavorably impressed as to the eight-wheel engines; but notwithstanding all the attendant trouble, experience in their use has led to a decided preference to them, and to an unanimous opinion that none other should be used on any road constructed of wood and iron, and to the belief that they will eventually be adopted on all railroads.

Although not embraced in the immediate objects of the committee, it was thought proper to take advantage of this opportunity to ascertain as far as the practical views of the persons before the committee was of value, what were in their opinions the principal evil with the arrangement of machinery, as is found existing in both eight and four-wheel engines. The reply was, in having the working gear out of view, and access of the engineers when the engine was in motion, and in having the direction of pistons and pumps horizontal, which renders it almost impossible to keep the parts well oiled, and when combined with difficulty of access, occasions a very great waste of oil; and that the correction of these evils would be of great practical value, especially on a road where so long a line of continuous motion is required.

On a plan being submitted and explained, which had in view an arrangement of the machinery of an eight-wheel engine, expressly intended to remove these objections, and embracing some other advantages believed to be of great value if they can be attained, the opinion was general that it would be successful, and that both the objects to be attained, and the probability of success, were highly in favor of such an arrangement.

On reviewing and comparing the above statements, it will be perceived that in no instance have difficulties or derangements in the machinery arisen from the fact of there being eight wheels to the engines. Nor has the principles on which the eight-wheel engines are constructed, had any agency in producing the evils complained of; but, on the contrary, the same results to a more injurious extent would have occurred to engines on four wheels, if constructed with the same defects of proportion and workmanship. It appears clear to the committee, that eight-wheel engines do not contain in themselves, either from any new principle introduced, or from the necessary arrangements of their parts in construction, the elements of self-destruction, to any greater degree than the four-wheel engines; nor do they effect the road as violently.

If, then, the conclusion be clearly established, that important advantages have been attained by the eight-wheel engines, that they are peculiarly adapted, and, indeed, indispensibly necessary, to the preservation of the road, and that the results anticipated are more than realized, it would appear to be a useless task to go into an examination of the causes which induced the Board originally to concur with the chief engineer in giving them a preference.

It might be sufficient for the Board to point to the results, and rest on them for their justification. They will, however, briefly advert to the state of things then existing.

At that time there were eight or nine English engines in the United States, which had been imported by different companies; four of them had been ordered for a road similar to ours in plan and material. The first trial on this road proved so seriously injurious, literally shaking its parts asunder, and breaking down the rails, (as was witnessed by one of your committee,) that a total abandonment of steam power was immediately resolved on, and the road was prepared at a great expense for the use of horse power. Two of the others were imported to be used on roads constructed of iron rails, on a stone foundation. Their performance had not been tested at the time our Board were compelled to decide on the plan and character of their locomotives; and also, whether they should be obtained at home, or from abroad, it was subsequently ascertained, that in order to render them effective, the number of wheels were changed from four to six. In addition to these facts, the Board had the example of the Baltimore and Ohio Company, which combined a greater amount of talent, wealth, and expense, than perhaps any other similar corporation in the nation. Many of the leading stockholders in this company were prejudiced in favor of English engines; from their connection with English commercial houses, they were enabled to obtain the most accurate information on the subject; yet with all these advantages we find them, after mature deliberation, offering premiums and other inducements to the American manufacturers, to engage in the construction of engines, rather than risk their importation from abroad.

All the accounts from England concur in stating the expense of repairing locomotives, and that not more than one-third of those

owned by the Liverpool and Manchester Company were fit for work at any one time, while at the same period, "The Best Friend," (the Pioneer of American locomotives,) and the "West Point," both of American manufacture, were worked with success upon our road.

Such was the nature of the circumstances, and the extent of the information possessed by the Board, when they were called on to decide on the character and extent of the locomotive power to be introduced on the road. The valuable improvements which genius, aided by the light of experience, has subsequently produced, being then unknown, of course afforded no aid to the Board in making their decision. Governed in their opinions by the facts which had at that time come to their knowledge, they authorized the construction of four eight-wheel engines, instead of six as recommended by the chief engineer, leaving it optional with that gentleman to contract for them at home or abroad. A highly advantageous engagement was made with N. Bliss, of New-York, by which his extensive works and experienced hands were placed at the disposal of our chief engineer, under whose immediate direction and supervision the engines were to have been constructed. Scarcely, however, had this arrangement, which promised such satisfactory results been commenced, when the cholera made its appearance in that city, and raged with peculiar violence in that section of it in which Mr. Bliss' works were situated. A total desertion of the workmen, and the utter ruin of the employer, was the consequence. Mr. Allen then applied to the Board for permission to proceed to England forthwith, as the measure best calculated to remedy this disappointment, and to place the engines at our command in the shortest time and on the best terms. Important as these considerations were, there were others that, in the opinion of the Board, were even more so, viz. The presence of the chief engineer on the line of road, and his personal supervision and direction in its construction. Under these circumstances, this Board authorized Mr. Allen to contract for the engines at the north, on the best terms he could obtain. Under these instructions Mr. Allen entered into a contract with the West Point Foundry. This contract was made at a time when, from the great demand which existed for that species of work, and the few establishments which could furnish it, on account of the dispersion of their workmen by the pestilence, that the manufacturers were enabled, in some measure, to prescribe their own terms, and, indeed, seemed rather as conferring a favor than receiving a benefit, by the acceptance of our work.

Your Committee, although they may have already extended their remarks to too great a length, cannot quit this part of the subject without bringing to the view of the Board a part of the evidence which they conceive has a direct and important bearing on the inquiry, "*What has been the cause of derangement as far as ascertained?*" Your Committee have special reference to the great velocity at which the engines have moved with heavy trains of cars attached, and would, without hesitation, assign this as a prominent cause of injury, both to the road and to the engines. Every witness questioned on the effect produced on the machinery by great rapidity of motion, unhesitatingly replied, that it was highly injurious. Indeed, it requires but a slight daily observation to convince any person, "that a series of shocks constantly repeated on machinery of so cumbrous a mass, so delicately adjusted in its parts, and so heavily strained as a steam engine, must greatly injure and rapidly destroy them."

Mr. Allen, in his communication of the 29th January, 1831, distinctly recommends that the speed of the "West-Point" be limited to ten miles per hour, without regard to the number of cars in the train. Mr. Stephenson, in reply to the inquiry made by the President of the Boston and Lowell Railroad Company, viz.: What do you consider the economical rate of speed at which Locomotives should travel? states that they should not exceed eight miles per hour, with freight cars, nor sixteen (16) miles per hour, with passengers, the latter speed yielded to, not from considerations of economy or durability, but solely to gratify the public in their wishes for rapid travelling. Mr. White, the gentleman who projected the Mauch Chunk Railway, and under whose directions it was constructed, thus expresses himself:—"The motion of twenty or thirty miles per hour, on railroads, will be fatal to waggons, loading and road, as well as to human life." "Our first two months' use was fifteen to twenty miles per hour; which would soon have ruined both road and waggons, and was, I am persuaded, much dearer than the turnpike on which was laid the rails."

The Liverpool and Manchester Company, after having experienced the injurious effects of rapid travelling, and been made sensible of its inexpedience where it was most sensibly felt, (in the revenue of the Company,) have lately decreased the speed of the locomotives upon their road. The item for maintenance and repairs of locomotives, for six months ending July 1st, 1832, was £10,582, which, with the repairs to the road, made an annual expenditure of £35,000 sterling money. At a time when it was represented that out of twenty-four engines, not more than six or seven were in working order, the others undergoing a thorough repair. The item charged in the semi-annual report to July, 1833, 'for repairs of machinery' is £12,000 for the preceding six months. From which it appears, that the working and repairs of the locomotives on the Liverpool and Manchester railway cost annually about £24,000, or, in other words, the startling sum of *£800 per mile per annum, for every mile of their line of road.

While on the subject of the cost of machinery, repairs, &c. it is deemed proper to correct an erroneous impression which has generally prevailed, in relation to a statement, in the accounts of the Company, submitted at the last meeting; by which it would appear, that the wages of the hands employed in the workshops amount to $28,204 14 cents.

This item has been generally, though improperly, supposed to contain the amount paid for repairing and keeping in order the running machinery on the road, when, in fact, it includes the salary of the several engineers charged with the superintendance of the locomotives, of the hands attached to the several trains, the wages of the laborers engaged in loading and unloading the freight cars at the depository; to which it may be added, that the work executed in the work-shops has been of the most miscellaneous character, embracing the construction and fitting up of passenger and freight cars, iron work for the passing places, sliding sections, and revolving platforms throughout the line; clamps, bolts and braces for the Edisto Bridge and stationary engine, with a variety of other jobs too numerous to mention.

No account has been kept of the separate performance of each locomotive, so far as to enable your Committee to form an estimate of the work done by each, and the amount of expenses chargeable to each. Such an account would be satisfactory, as it would furnish valuable data, by which the relative value of each could be fully estimated.

The cash receipts is not a fair criterion, as it forms but a part of their actual performance.

The annexed statement, marked E, is an estimate of what it would have cost for the transportation of material to construct the road at the railroad price of transportation; which, although not money that *came in*, was certainly money *kept* from *going out*; if *not made*, it was evidently *saved*, and is justly creditable to the engines.

The statement annexed and marked D, exhibits the performance of the engines from the 1st of June, to the 18th of the present month.

The statement marked F contains an account of the passenger and other cars added since the meeting in May.

By reference to the books at the depository, it will be seen that the performance of the engines, since the meeting of the stockholders on the 4th to the 18th of the present month, has been as follows:

Phœnix, 4 trips ascending and 4 descending, with passengers,	$1286 50
Charleston, 2 trips ascending and 3 descending, freight $236 79, passengers $648 44	875 33
Edisto, 2 trips ascending and 1 descending, passengers, $531 75, freight up, $180 00, freight down, $115 67	827 42
	$2,989 25

The return trip of the Edisto on last Saturday, and the upward trip on Monday, in freight and passage money amounted to $620.

All of which, is respectfully submitted, with the unanimous concurrence of the Committee,

ALEXANDER BLACK,
Chairman of Committee on Cars.

Charleston, 19th Nov. 1833.

At a meeting of the Board on the 19th inst., Resolved unanimously, That the above be accepted, and laid before the stockholders at their next meeting.

JOHN T. ROBERTSON, Secretary.

D.

Statement of the locomotives on and off the road, from the 1st of June to the 18th of November, both included: South Carolina—from 1st June to 7th September, on the road 47 days, off the road 52 days—90. Charleston—from 1st June to 18th Nov., on the road 37 days, off the road 134 days—171; not entered for regular work till 1st day September; the time chiefly occupied in new modelling and alterations. Barnwell—from 10th June to 20th September, on the road 80 days, off the road 23 days—103. Edisto—from 8th Sept. to 18th Nov., on the road 26 days, off the road 45 days—71. Phœnix—from 1st June to 18th Nov., on the road 250 days, off the road 21 days—171; during the above time, she has occasionally performed double duty. Hamburgh—three trips on trial, and taken off the road.

E.

The locomotives have transported the following materials for the use of the road:

1500 tons iron, value in freight at 7 cents per ton per mile, -	$7,500
75 tons spikes, - - - -	350
1500 tons timber at an average of ten miles, - - - -	1,050
	8,900
—— tons of fuel for use of engine, workmen, back and forwards, provisions, machinery for inclined plane, revolving platforms, pumps, &c. equal to and including contractors and their agents, provisions, tools, &c. assumed, - - - -	12,500
	$21,400

The land transportation and conveyance by water attendant on the above, would, from the difference of value between the rates paid, and those charged, have augmented it to $64,200, or thrice the amount estimated.

F.

Statement of locomotives, passage, crank, freight, and tender cars on the line and at the depository, made since 1st day May, 1833: Two eight-wheel locomotives, Barnwell and Edisto; 1 four-wheel do, Hamburgh; 3 improved passenger cars; 4 do. ready for mounting; 10 do. on hand, (not finished); 1 crank car; 40 freight cars, (completed); 28 do. on hand not finished; 5 tender cars with butts; 9 do. with water tanks; 24 covers for freight cars; repairing freight and passage cars at various times; 1 baggage car ready for mounting.

JOHN GROSS, Clerk of Works.

Charleston, Nov. 18, 1833.

Three freight cars burned on the road; 1 improved passage car broken to pieces on the road; 1 old do. do. do.

* Notwithstanding this immense expenditure for repairs, this Company has declared a dividend of 8 guineas per share, equal to double the usual interest of the country.

Suspension Railway.—We have frequently been asked how the Suspension Railway is constructed; and how, when constructed, it could be used to any purpose with but *one rail*. Of the suspension railway we had heard much said, but had seen no description from which a correct idea could be formed, and therefore could not give an answer. The great object of the Journal, however, being to furnish information to all who wish it, relative to all kinds of railways, we took measures to obtain, through a friend in Boston, from the patentee, Henry Sargent, Esq., such a description, accompanied with drawings, as will enable any person to understand the principle upon which this cheap and convenient mode of internal improvement is constructed. There is certainly much ingenuity displayed by the inventor, in the construction of his model; and although we are not altogether satisfied that the invention will prove of great importance in practice, yet we consider it well worth the attention of those engaged in the construction of railways, as we are every day more convinced that we are only at the *threshold* of a successful tide of experiment in the construction of railroads. We are, in truth, at this time only *beginning* to learn to construct railways. Twenty years will do for railways what the same period has done and *is now* doing for *steamboats*. Instead of costing *twenty* or *thirty* thousand per mile, and travelling 15 to 25 miles per hour, they will be constructed for one-half the money, and we shall be able to travel at the rate of twenty-five to forty miles per hour. This, we are aware, will, by some, be deemed visionary; yet a moment's reflection upon the rapidity and extent of the improvements of this country for a few years past, will convince any one that the past warrants even greater expectations than is here predicted.

The *suspension* railway has not heretofore been properly brought before the public. We shall, however, endeavor to obtain, as we trust we shall be able, from the gentleman who has so obligingly furnished us with the following, further descriptions, with accounts of its performances, &c., by which a more correct opinion may be formed of its merits.

Suspension or Single Rail Railway.—Imperfect descriptions of this invention have been published in pamphlets and newspapers, in England and America; erroneous impressions, however, have existed in regard to it, which it is the object of the writer to remove. The erection of the Single Rail Railway in England, and similar experiments in this country, have demonstrated this invention to be practicable, and no one doubts its utility. The superior excellence of this Railway, in comparison with all others, lies in its economy; a point which, it cannot be denied, in the ardor of speculation, is not always sufficiently regarded. The very simplicity and cheapness of an article are not unfrequently the cause of its condemnation, since it is neither "dear-bought nor far-fetched:" considerations, which seemingly enhance the value of our possessions. All other advantages being equal, economy must turn the scale in favor of the Single Rail Railway. To avoid the effects of frost and snow, the foundations of all railways, *in this climate*, must be equally deep, and their tops more or less elevated. It is not perceived that this kind of Railway is inferior to any other, in its capacity for the transportation of heavy loads; nor in those facilities, by which it accommodates itself to every purpose of transportation. It is manifest that no estimate of any Railway, per mile, can be made, without a full knowledge of its location, and of the tonnage, *per wheel*, intended to be transported; for the more the weight is distributed, the lighter and less costly may the railways be. The Single Railway must always be less expensive, other things being equal.

Should the surface of the route be unequal, the plane of the Rail may be maintained, by elevating it to a reasonable height on posts of unequal length. From this circumstance, it must appear to the most casual observer, that a great *additional* saving in embankments, culverts, bridges, drains, &c. is claimed for the Single Railway. It has been objected to the Single Railway, that it is occasionally elevated, for the reasons above stated. But is this a comparative objection? Is it not common to both, and to all? The Double Railway at Quincy passes over intervals, in some places, twenty feet deep; and the Rails, and *horse path also*, are elevated accordingly. Yet the railway at Quincy was constructed expressly for the transportation of heavy masses of granite. All writers, on the subject of Railways, have adverted to lateral pressure, as a point of great consideration. This effect is inseparable from the very nature of the Double Rails. But in Single Railways much less allowance is required for lateral pressure: hence it is believed that the Single Rail can carry more than the Double, in proportion to the number of wheels employed; for friction is diminished, in proportion as the lateral pressure is taken away. This lateral pressure causes the flanges of the wheels to rub on the sides of the Rails, and corresponding effects are produced, at all the axles of the wheels; for the load on the Double Rail is immediately upon the axles, communicating its impulses directly and entirely to them.

On the Single Rail, such is not the case: the load is placed at the ends of the bars, and all motion is necessarily diminished at the axles, which are very *short*, and may be made much *less* than usual, as they are not compelled to bear those shocks which result from lateral pressure. The late experiments in England have demonstrated the superior power of the Single Railway, for the carriage of heavy burthens, attributable, in a great measure, to the causes above recited.

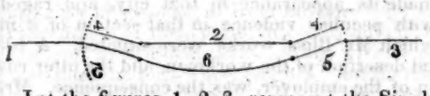
The most perfect steadiness of motion is secured to the carriage, on the Single Railway, by the late additional improvement of the Friction Rail and Rollers: being a splendid Rail or rod placed on one side only of the supporters, and which bears the pressure of a few pounds only, amounting to nothing more than a slight difference, in the two parts of the load, and causing the heavier side to bear lightly on the Friction Rail. This pressure amounts to nothing more than that which occurs in adjusting the loads of common carts and trucks, with this difference, that the pressure is maintained longitudinally in the one case, and laterally in the other. It has been supposed, that a precise equipoise of the two portions of the load was indispensable. This is by no means required: a *difference* may exist of two for one, as a leverage takes place, which prevents all ill effects from such cause.

On the Single Railway, the load is more easily put on and taken off. The single Rail may be more easily maintained in its proper position; the supporters and their foundations are not likely to be affected, by ordinary causes. The foundations are below the influence of frost, with several feet of heavy stone abutment on both sides, or packed with good gravel, unmixed with perishable earth. Should any change take place, which is not expected, as the pressure of the load is perpendicular, the carriage may still follow the inequalities of the single Rail; whilst any considerable change in the position of either Rail of the double Railway must obviously impede all progress for a time, as effectually as it would be impeded on a common road by a fallen tree, or similar obstruction. This Railway may be made of wood, stone, or iron: if wood, various means may be employed for its preservation.

It is not believed that, in point of facilities, any Railway is superior to this which is now recommended. As in other Railways, so in this, hills are ascended and descended; roads are crossed, above or below, as they are crossed by canals, and by other modes; the passage of streams is effected on piles, or in *railway boats* particularly adapted to this object. It has been objected to the Single Railway, that, because of its elevated position, it must impede the common travel, which may lie across its path. We have already shown that this elevation is unavoidable, and that all objections, on this score, are general, and applicable to every species of Railway, *in this climate:* for all Railways are elevated; the Single, on the posts, and the Double, on embankments and supporters also.

Crossing places are required, in both Single and Double Railways, at eligible points, and can as easily be made in the former, as in the latter.

The passings or turnouts are effected with as much ease, on the Single as on the Double Railway, as the following sketch may demonstrate:



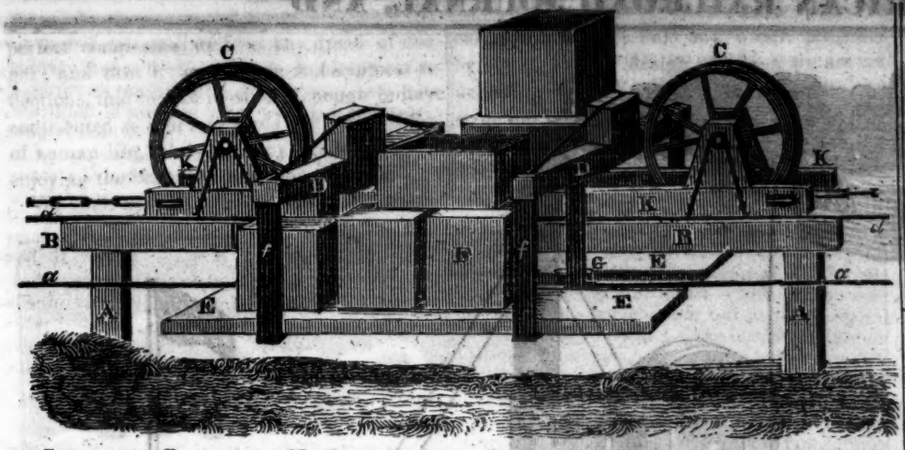
Let the figures 1, 2, 3, represent the Single elevated Railway, with the portions 4, 4, thrown back, on simple but strong hinges or joints, which, when closed, form their respective parts of the Railway, being fastened by a simple latch.

Figure 6 represents the turnout. 5, 5, two curved portions of the sideling or turnout, moved on strong joints; when closed, as in the sketch, connecting those parts of the Rail 1, 3, with the sideling 6. A light carriage, travelling fast from 1 to 3, will at all times pass a slow carriage and take the lead of it, by turning on to the curved Rail 5, to the Sideling 6, to the main Rail 3. The driver of the slow carriage having ample time, without stopping his carriage, to step forward and close the straight bar 4, and open the curved bar 5, with one motion of his hand, they being connected at bottom, (see dotted lines.) The slow carriage passes on to the main rail 2, and the driver replaces the bars as in the sketch, or they may be replaced mechanically; the fast carriage, coming up in the meanwhile, passes forward, the slow carriage being at No. 2. This mode is more particularly adapted to two Single Railways—one for going and the other for returning; but it may be used with advantage travelling both ways on one Rail—and is similar to the mode adopted on the Double Rail, except that there are no cast iron plates with grooves, &c. which probably will not be very convenient in our frosty climate—especially as there are many of them at each sideling. The annexed drawing is a perspective view of the Single elevated Railway and carriage, which may be raised on supporters of two and a half or three feet on level ground, and more on uneven surface, as circumstances may require.

The carriage cannot overturn, or incline farther than the friction rail, and may be of any ordinary breadth and length, and braced and strengthened as may be thought proper, and easily adapted to its particular use; and if the centre of gravity is below the top of the rails, the load may be placed higher than the top of the wheels, which, if the above principle be regarded, may be of the largest diameter; and even regardless of this principle, if the friction rail and rollers be employed.

If any objection exist, in relation to the Single Railway, such objection should be very formidable when opposed by considerations of great economy, superior advantages, and peculiar applicability to our own country.

Boston, April 30th, 1827.



Suspension Railways.—Many years ago, after the subject of railway transportation had begun to excite general attention both in England and America, the suspension or single railway was invented *originally* by Henry Sargent, Esq. of Boston, Mass. This invention (for, as the English writers say, it can with no more propriety be called an improvement than the plough can be called an improvement of the spade,) did not for many years attract the attention which its importance appears to deserve, and it remained for a long time without benefit to the public or advantage to the inventor and patentee. Circumstances, which we shall by and by refer to, took place about twenty years ago, which tended to make this railway better known; but at the same time Mr. Sargent found that he was in some danger of being deprived of his fame as inventor, and his right as patentee; and he consequently took some prompt measures to vindicate both.

Among other railways of Mr. Sargent's invention in the United States, there are now two in the county of Suffolk, Massachusetts: one at Chelsea, of a circular form, and a few hundred feet in extent, is used only for purposes of amusement, and is in fact a deviation from his original invention, and no more than an extensive model. The other, at East Boston, is a suspension railway, as lately improved, and has been commenced within a few months; and is not yet entirely completed. This railway is constructed over a marshy piece of ground, full of creeks and ponds, and much more unfavorable than the average surface of the country.

By the help of the plate, which, with the exception of the friction rail, *a a*, represent the railway and car, as first invented, we shall endeavor to convey some idea of the principles of the suspension railroad, and then to point out the improvements which have been subsequently made.

A A are the wooden posts driven or otherwise secured into the earth, upon which the rail is to be supported. The ground in the annexed plan presents a level surface, not requiring any difference in the length of the supporters. But where the surface is uneven, these can be left of unequal length, and braced every three feet from the top of the rail, according to the undulations of the surface, so that the tops of the supporters shall be on the same level. There have been various expedients suggested for securing these posts in the ground, in order to diminish the tendency to incline from the vertical posture, by the weight and motion of the loads which they are destined to bear. The lower extremities of the posts should be sunk in transverse trenches to a depth of four or five feet, more or less, and placed upon a foundation of hard earth or stones. The sides should be filled up with rubble stones, or otherwise braced. The post should be supported, (in marshy soils,) by at least one strong timber, placed obliquely in the ground and bolted into it, by which it will be stiffened by the oblique timber, and secured from inclining in the opposite direction

B B is the bearing rail, made of strong timber, of dimensions proportioned to the weight intended to be supported. This rail is to be firmly fixed upon the supporters with mortice and tenant. When the wheels C C are intended to be guided with flanges, it is advisable to have the top of the rail shod with iron, *d d*, in order to prevent the flanges from fraying, or, as it is called, brooming the sides of the rail, and thereby wearing it out and making it uneven. C C are the wheels, placed one before the other, in a direct line on the rail, and provided with flanges on either side, to keep them in position. From the axles of these wheels are suspended the horizontal bars or frame work, K K, to which the cars for passengers or merchandise are connected by the transverse bars D D, and strong, inflexible frame *f f*, so that the cars are balanced on each side of the rail, like the bags of a pack saddle. F is the loading placed on the cars in readiness for transportation. It might be objected by persons not acquainted with mechanics, that this method of transportation is unsafe, because there being but one line of wheels, the cars would be overturned, unless the load is very equally balanced on each side of the rail. It is of course better that the load should be so balanced, but it could very easily be shown in practice it is impossible that the cars can be overturned when the materials hold together. When one side is heavier than the other, a slight inclination of the heavier side takes place, and that is all; for as soon as the heavier side begins to incline, it approaches the centre of gravity, and is thus continually losing its tendency to incline, and cannot incline further than the supporters, as the car is longer, &c.; while, on the other hand, the lighter side is receding from the centre of gravity, and is consequently gaining power to balance the other by the leverage which takes place. We have frequently seen that a person carrying a single pail of water will extend his disengaged arm at right angles with his body, and by this simple instinctive motion, one arm alone is made to balance the other with a weight of twenty pounds at the end of it. A very great additional security is derived from the very low position of the centre of gravity, owing to the load being placed below the wheels, instead of above or on a level with them, as is the case in common carriages. It is also impossible that the car should be overturned in case of the breaking of the axles, for the load being on each side of the rail, and below the centre of gravity, the body of the car would fall but one-fourth of an inch, and slide on the rail, if in motion, and there be firmly supported.—Such are the general principles of the suspension railway as originally invented by Mr. Sargent.

A few years ago the plan of a railway precisely similar in its nature was submitted to the British public by H. R. Palmer, Esq., and it has been generally noticed in English scientific works as Palmer's Patent Suspension Railway, no acknowledgement being made of Mr. Sargent's prior claim. It is impossible to say whether the English inventor had taken any hints either directly or indirectly, from the American. We do not know that he had ever heard of it, but it is very certain that the latter could have had no possible assistance from the former, because he had demonstrated its practicability by actual experiment, many years before it was mentioned on the other side of the Atlantic. This discussion, however, is of little consequence. Newton's argument, with regard to Leibnitz's alleged discovery of fluxions and the differential calculus applies with equal force to this case. Whether Mr. Leibnitz invented it after me or had it from me, is a matter of no consequence, as second inventors have no rights.

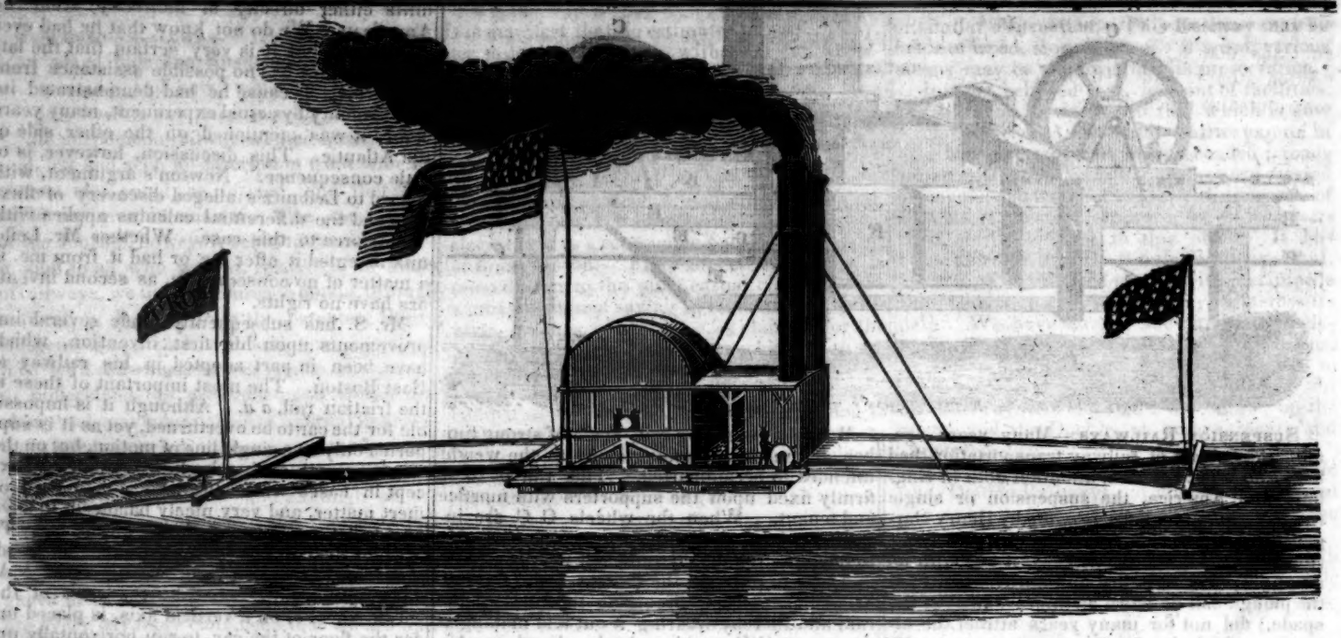
Mr. S. has subsequently made several improvements upon his first invention, which have been in part adopted in his railway at East Boston. The most important of these is the friction rail, *a a*. Although it is impossible for the car to be overturned, yet as it is supported only on a single line of motion, but on the whole breadth of the wheel, it would be apt, except in cases where the load is composed of inert matter, and very nicely balanced, to have an oscillating vibratory motion on the rail. To prevent this the small rail *a a*, made of wood, is fastened on each side of the supported A A, and to prevent friction from the sides of the car, a wheel *b*, on a vertical axis, is placed under the floor of the car, to run horizontally upon the rail. The pressure upon this rail is very trifling, amounting to much less than the difference of weight between the two sides of the loaded car, because the overloaded side having a tendency to descend in a perpendicular line, the oblique pressure upon the friction rail is smaller than the whole tendency of the loaded side to descend. The rail may therefore be of a small size, and can be furnished at a very trifling additional expense; and by means of it, the car, even with a shifting and varying load, will be kept as steady as if upon a double track.

Another great improvement has been suggested with regard to the wheels. If the wheels are kept on the main rail by flanges, as in the plate, it is absolutely necessary that the rail should be shod with iron, which causes a very great additional expense. If this is not done, the continual friction of the flange on the edge of the rail, will cause it to fray or broom as before stated. To obviate this difficulty, the wheels may be made wider than the rail, without flanges, to run freely upon the smooth surface of the rail, and to keep their direction, guided by rollers, of which the place only can be seen in the plate, may be placed horizontally at *c c*, to run on the side of the rail, thus answering every purpose of the flange, but with a much smaller degree of friction, and with a saving of the whole expense of the iron guard for the rail.

A due regard being had to the principles above stated, the cars intended to be put upon the railway may be varied according to the nature of the articles to be transported, and the fancy or taste of the proprietor. The railway at East Boston, is as we have before said, built over a tract of marshy land of a peculiarly unfavorable nature. The supporters are piles driven through the marsh to a stratum of blue clay beneath, and strengthened by oblique braces. Being merely an experiment, the cars to be placed upon it are intended only for the transportation of passengers to a place of entertainment, at the farther end of it.

The only serious objection that has been made to the suspension railway is, that being elevated so far from the ground, it may not be so sufficiently permanent, and so capable of bearing heavy loads, at a *rapid* rate, as the iron rails which are elevated only a few inches. We do not wish to discuss this question, though many persons whose opinions in these matters are of great weight, believe that it may be made sufficiently permanent for all practical purposes.

[For the conclusion of this article see page 832.]



[*From the Mechanics' Magazine.*]

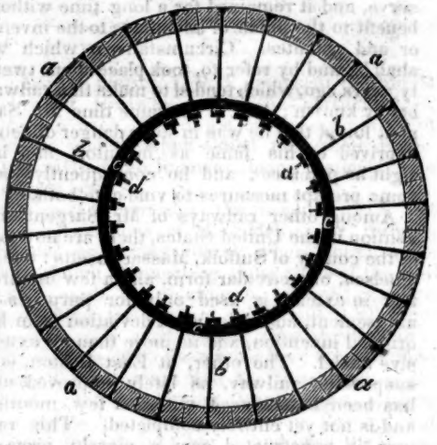
THE NEW ERA OF STEAM POWER.—In our first volume, at page 118, we inserted a short article on the probable application of steam power to various purposes during the year, which is now nearly brought to a close. We there state that "every day brings to light some new form in which its irresistible energies may be employed. Ten years ago the idea of substituting a steam engine for a horse, as propelling power on a turnpike road, would have been thought chimerical. * * * We shall not be surprized to find it, before the year is out, employed to extinguish fires, to blast rocks, or in excavating the earth for canals. No man can set bounds to its utility, or the modes of its application." Since then we have received various reports of the success of steam carriages on common roads, and as a proof of their being in practical operation, we refer our readers to page 311 of this Magazine, where will be found an account, (taken from the London Repertory of Arts for November,) of their performance on one of the most crowded roads in the vicinity of that metropolis; it has also been used in extinguishing fires, as will be seen by reference to page 329. Inventions and suggestions of importance, as connected with steam power, have within the last few weeks so multiplied upon us that we have resolved to give, in as condensed a form as possible, all the information we have received in this article, and as one of the most important, we shall commence with an account of Mr. Burden's new steamboat, an invention which we hesitate not to say is of the first importance. (See above engraving.)

[The account here referred to was published in the Railroad Journal of December 14th, page 789:]

Our readers will have observed that the construction of this boat is on a principle that can scarcely be misunderstood by any one. Every person knows that a mass moves more easily through the water endwise than sidewise; and as the editor of the Journal of Commerce very justly observes, "Mr. Burden has carried the principle to its *ne plus*; instead of building a boat so narrow that she could hardly be made to stand erect, he has made a *pair* of boats, and so being relieved from all danger of capsizing, he has been able to elongate them to his heart's content." The rudder, which is placed immediately behind the flag with the word TROY on it, is only a plate of iron about 6 feet long, and about 5 inches wide, and is governed by the motion of a steering wheel, placed parallel with the boiler, on the same trunk to which it is connected by ropes, as will be seen in the engraving: it is similar to a common steering wheel, and as the chief weight of the parabolic spindles or trunks is in the centre, it causes it to revolve as on a pivot. This may be illustrated by placing a common rolling pin used in making pastry, of the same form, on a table, and turning it; that will form a complete circle, and on that principle, this boat turns, whereas all other vessels turn on their stern.

Fig. 2 is a cross section of the internal part of one of the trunks: *a a a a*, the staves, 26 in number, 3½ inches thick, to each of which is attached an iron bolt, *b b b*, 26 inches in length, passing through the staves, and countersunk on the outside of them: these bolts are fastened to an iron ring, *c*, by means of nuts, *d d d*,

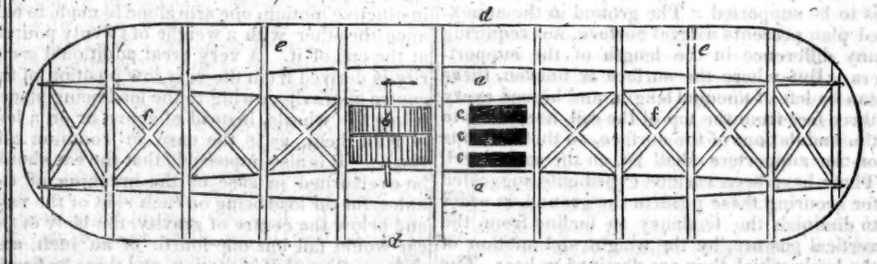
Fig. 2.



screwed on the inside; so that the tighter the nut is screwed, the more compact it makes those staves immediately opposite. Sufficient room is left in the centre for a man to enter and pass fore and aft, to turn the nuts, if necessary.

Fig. 3 shows the plan of connecting these two spindles or trunks, upon which the decks are to be built. *a a*, the trunks or spindles; *b*,

Fig. 3.



the water wheel; *c c c*, the boilers; *e e*, the beams which connect it with the outside guard *d*; *f f*, the braces.

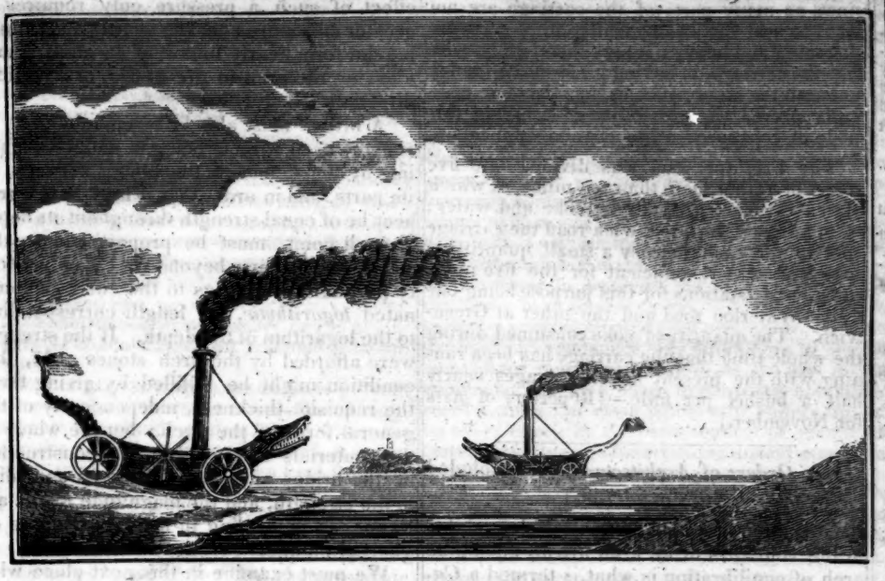
We think it right to state another fact in connection with the advantages which we have enumerated; and that is in her complete exemption from jarring or vibration while under way. The passengers in this boat could easily imagine themselves upon terra firma, were it not for her great velocity.

It is, we understand, to be named the EMMA, OF TROY, in respect, on the part of the inventor, to his amiable and intelligent partner for life.

The boilers have been constructed under the direction of the Rev. Dr. Nott, who accompanied us on our trip, a man distinguished by his piety and scientific attainments; and we have the authority of the editor of the N. Y. Gazette, for stating that "Dr. Nott stated that he would have no hesitation in placing his cot over the boiler, at all times, and going to sleep with

perfect composure, without any dread of danger; and that it was among his happiest reflections, that he had lived long enough to have contributed so much towards the preservation of human life, while so many thousands were enjoying the benefit of steam navigation."

We shall now introduce a plan of a machine calculated to go by land and water, propelled by steam, for the design of which we are indebted to the "Young Mechanic." Its construction is so simple that we consider a description unnecessary. In those districts where ferries are frequently to be crossed, we think it might be advantageously used.



Hitherto the chief obstacle of going long voyages by sea in steamboats, has been the difficulty of carrying sufficient fuel. That obstacle is in a great measure obviated by a discovery of Mr. Rutter, an engineer in England, for generating heat by water, to which we have before alluded at pages 117 and 182, and which we think still we shall be able to prove was first discovered by an American citizen. At present, we shall copy Mr. Rutter's account from the London Mechanics' Magazine.

[For the article here alluded to see Railroad Journal of November 2d, page 690.]

In the London Mechanics' Magazine of October 5th we find the following further particulars;

As I find that the question I recently proposed to your valuable correspondent, Mr. Rutter, as to his new process, is inadvertently so worded as to be liable to misconstruction, I take the earliest opportunity to desire its correction.

The process in question is not for "making gas" only, but for *generating heat* for all the purposes to which that powerful agent is applicable, as must, indeed, have been by this time gathered from the articles on the subject in the Mechanics' Magazine. Gas is produced, it is true, in the first instance, from the combustion of the tar and the water, but it is instantaneously converted into flame, to be used *in any case where heat is required*—whether the manufacture of gas for illumination (to which it has been applied at Salisbury), the production of steam for numberless purposes of manufactures and navigation, or a thousand other equally important uses. Gaseous matter has, I understand, been before obtained from water to some extent, but only by means of processes too expensive and too complicated to be of general utility. I remain, Sir, yours respectfully, F. H.

London, Oct. 1, 1833.

From the same Magazine of October 19th, we also make the two following extracts:

The notices of Mr. Rutter's new process for generating heat have greatly interested me, and having some practical knowledge of the great difficulty of obtaining sufficient "stowage" for the fuel in steam navigation, without encroaching on the space required for other purposes, and disturbing the trim of the vessel too much, I am disposed to think that Mr. Rutter's discovery will do much towards changing "the face of the world," and to believe that the period is "now fast approaching, when communication by steam may be established with every part of the globe."

The economy of this plan, in *weight* and *cost*, will appear the greater, if we compare it with the expenditure on the present system. According to the data given by your correspondent, in No. 529, the account will stand as follows:

To produce an effect equal to 120 lbs. of Newcastle coal, will require 15 lbs. coal tar, say 20 lbs. water, and 25 lbs. coke, in all 60 lbs. But as water may be supplied from alongside as wanted, deduct 20, leaving 40 lbs. of fuel, which, on Mr. Rutter's principle would produce an effect equal to 120 lbs. Newcastle coal, or three times the weight of the fuel at present used. If Mr. Rutter's data *only* approximate to the exact proportions, we cannot fail to be struck with the extravagant waste of fuel upon the present system. Every commander of a steam-vessel knows, or ought to know, that the ashes, *and cinders too*, which are thrown overboard, are not nearly equal to half the weight of coal consumed in a given time. From what has passed under my own observation, when in command of a steam-vessel, I am inclined to think that they do not exceed, in ordinary cases, 10 per cent. of the fuel consumed; and if so, there is a difference of 48 lbs. to be accounted for out of every 120 lbs. of coals consumed. Where this goes we can be at no loss to imagine, when we observe the immense volume of smoke which marks the course of a steamer at sea; even with the most careful stoking, a vast quantity of inflammable matter passes off unconsumed. Deducting the actual loss in this way, it appears not improbable it would be found that the difference of the total weight of the inflammable matters, efficiently *applied to the generation of steam*, would not be so great as it appears to be at first sight.

From the preceding statement it appears, that there is a balance in favor of Mr. Rutter's method of generating heat of 200 per cent., as compared with the weight of Newcastle coal, and that by loading a vessel with the same weight of fuel, to be consumed on this plan, she would be able to keep the sea three times as long as at present.

Another, and by no means unimportant advantage of Mr. Rutter's plan, is, that the material required being fluid, and withal of less specific gravity than water, it may be advantageously stored in tanks fitted to the vessel, in those spaces which are now comparatively useless, and may be so disposed as to serve in lieu of ballast, and thus render steamers less crank than they now are. As each tank is emptied it may be filled with water, so as to preserve the same trim during the voyage, which is by no means an unimportant consideration, as it is well known that swift vessels are much sooner put out of trim than others. The absence of the large funnel, which is now required, would be a great advantage, both in velocity and comfort in a seaway.

With regard to the comparative economy of Mr. Rutter's method of generating heat, it obviously depends upon the cost at which "the bituminous, oleaginous, resinous, waxy, and fatty substances, in a fluid state," can be procured.

Suppose that coal tar is used. This article could at one time, and may now, probably, be obtained for 1*d.* per gallon at the works, or even less. Taking it at 1½*d.* per gallon, and coke at 28*s.* per chaldron, weighing (say) 18 cwt., then the account will stand thus:

1¼ gallons tar 1½*d.* 25 lbs. coke (say—¼ bush.) 4½*d*
—6*d.* cost of fuel on Mr. Rutter's plan, equal in effect to consumption of 120 lbs. Newcastle coal on the present system;

120 lbs. Newcastle coal = say 1¼ bush. at 9*d.* per bush., would cost 13½*d.*, or 125 per cent. more.

Something must be allowed for the expense of the apparatus for injecting the inflammable liquids into the fire, &c.; but even here an allowance should be made, on the other hand, for the increased room which would be available to other purposes than the stowage of fuel, for which it is now required—for the saving of the cost of the funnel—and also for the reduced expense of repairs to the hull of the vessel, in consequence of not being subject to those irregular strains in a gale of wind to which steamers are now liable.

I have no personal knowledge of Mr. Rutter, but I could not forbear addressing the foregoing observations to you upon the subject of his invention, which I find is already quibbled about, nay, by some decried, on account of its very simplicity! Let them remember the tale of Columbus and the Egg, and try to discover its application in the present case.

I am, &c. GEORGE BAYLEY

Ipswich, Oct. 3, 1833.

I perceive by your last notice, that Mr. Rutter is preparing for publication a work on the application of his new principle, and I beg to assure him that he has my sincere wishes for the complete success of his patent, &c.

It occurred to me, that about fourteen years since, in consequence of a paragraph which had then met my eye, I had been induced to make the following experiment: About equal portions of common tar and water were put into a half-pint glass retort, after which the orifice of the beak was reduced, by drawing out at the table blowpipe, to about one-eighth of an inch diameter. The retort being fixed over an argand lamp, the apparatus was taken into my garden on a dark night, and the contents of the retort brought to a state of brisk ebullition. As soon as vapor issued with rapidity, a light was applied, and in an instant I beheld a jet of flame eight or nine inches in length, constituting a brilliant firework, the intense heat of which was found capable of melting several refractory mineral substances. I lay no claim to originality in this little experiment, which is precisely the same in principle as Mr. Rutter's method, and this the following extract, which gave rise to my experiment, will show:

"AMERICAN WATER-BURNER.—An apparatus, called the American Water-Burner, has been invented by Mr. Morey, of New-Hampshire. It is a rough blowpipe, but is applicable in many cases in place of a furnace. Tar is intimately mixed with steam, and made to issue from a small jet, in the manner of an eolipile, and the stream of matter being ignited, produces a flame of great size and intensity. It appears that the water is partly decomposed towards the middle of the jet, and that the heat is thus increased by increasing the quantity of active agents; but, whatever the exact effect, the water is found to be useful in preventing the formation of smoke, and increasing the combustion."—[New Monthly Magazine, April, 1819.]"

Perhaps, Mr. Editor, you will indulge me in a few more remarks. In the autumn of 1827, a scientific friend and myself succeeded in beautifully illuminating a very large room, then used as our laboratory, with gas obtained from the decomposition of resin; and being at the same time occupied with the oxydrogen blowpipe, in producing intense light by means of lime and other substances, it occurred to us that the light thus furnished would prove admirably adapted to the purposes of illuminating objects usually exhibited by the solar microscope. In the course of a few weeks, subsequently, the illuminating power of resin gas, and the principle of applying the light of lime to the microscope, were practically demonstrated in a lecture before the Canterbury Philosophical Institution. I believe it was early in the following year that I was informed a patent had been granted for lighting a town on the continent with "resin gas," and every body knows that, during the present year, the "gas

microscope" has been brought out as one of the popular exhibitions of the metropolis.

Now I feel convinced, Mr. Editor, that both these plans were originated and carried into effect independent of any thing made public by me; and just as well am I satisfied, notwithstanding the extract previously given, that the principle of generating heat, now made known, is as purely original with Mr. Rutter. Coincidences of this kind have frequently happened, and the more men are taught to think for themselves, the more frequently they will happen, which, after all, is nothing more than another proof of the value of scientific acquirements. Mr. Rutter, I feel persuaded, will not mistrust my motives in offering these observations to his notice: had I not done so, it is very probable some one else would shortly have made him acquainted with the "American Water Burner," and perhaps might unjustly accuse him of plagiarism at the same time. I am, Sir, very truly yours,

W. H. Weekes.

Sandwich, October 18, 1833.

In conclusion, we beg to assure our subscribers that we have sent to the Patent Office at Washington for drawings and specifications of the "American Water Burner," which we fully expect will appear in our January number.

Journeys from London to Greenwich.—In our last number we had the pleasure of giving an account of the first business-like journey performed by a steam-carriage on common roads; and we cannot but feel gratified at the demand which the accuracy of our information has produced.

It was very generally believed, particularly amongst horse-coach proprietors, that the public would be prejudiced against this new mode of conveyance; and in entering into arrangements for running steam-carriages, this objection has been raised as a reason for reducing the premium required by the patentees, it being stated, that steam-carriages would run for a length of time at a loss, before the public would venture regularly to travel on common roads by steam. Sir Charles Dance, at the time of running between Gloucester and Cheltenham, had never discovered that such a prejudice existed, but that the contrary was really the case, every one appearing desirous of becoming a passenger. This point has however been further set at rest, by the same carriage, (which performed the journey from London to Brighton and back), having run for eight successive days from Wellington street, over Waterloo Bridge, to Greenwich, three times a-day, starting regularly at eleven, half-past twelve, and two o'clock, each day, a distance, in the whole, of about 250 miles, at an average running of ten miles per hour.

In order to call forth as little opposition as possible, from the coachmen and their attendant imps, at the same time to show that the public mind is by no means against the introduction of steam-carriages, Sir Charles Dance determined not to run for the ordinary charge, but the coach was advertised to run for two shillings and sixpence each person, to or from Greenwich, or the sum of four shillings to those who were desirous of going and returning: by such a course it was evident that curiosity would be the principal motive for going with the carriage. We are informed that, on an average, fourteen persons accompanied the carriage each trip. Such has been the interest displayed, that crowds of persons lined the road; and at either end of the journey so dense were the crowds, that, but for the command over the engine, and the accuracy of the driving some serious accident must inevitably have occurred. In some of the journeys, the steam-coach was accompanied by many of our scientific men, amongst others Mr. Telford, Mr. Macneill, and others of our best engineers, who expressed themselves so much gratified with the success of Sir Charles Dance, that they have determined on running the carriage a journey between London and Birmingham, the more fully to demonstrate the practicability of using the power of steam on common roads: and the carriage has been taken off the Greenwich road for this purpose.

We have very carefully examined the steam-carriage, and observed the ease of its running, and believe, that when Messrs. Maudsly and Field shall have completed a carriage, it may be expected to run on an average of fifteen miles an hour, with light weight. It should be understood, that the present carriage was not built by these talented engineers, but that the boiler only is of their manufacture; nor can they venture to use its full power on the engines, as many parts of the carriage are not equal to bear the strain, whilst other parts are too strong and heavy; it may therefore be said, that the carriage, in having performed so much under all the circumstances, has the more positively proved the possibility of bringing this mode of conveyance into general application.

The Brighton road was divided into five stages of rather more than ten miles, at which places the carriage took in coke and water; in running on the Greenwich road the carriage took in for each journey a small quantity of coke and water, sufficient for the five miles run, the two stations for this purpose being one in the Waterloo road and the other at Greenwich. The quantity of coke consumed during the whole time that the carriage has been running with the present boiler, averages nearly half a bushel per mile.—[Repertory of Arts for November.]

Of the Orders of Architecture. [Concluded from page 758.]

Construction of Arches.—If the weights of the voussoirs in an arch are all equal, the arch of equilibration is what is termed a *Catenarian* curve, the same that a chain or cord of uniform thickness would assume, if hanging freely, the horizontal distance of the points of suspension being equal to the span of the arch, and the depth of the lowest point of the chain being equal to the greatest height of the arch.

If the figure of the chain were reversed, the joints being such that the force, which was a *pull* in the first situation, becomes a *thrust* in the second, the chain would support itself, and remain in *equilibrio*.

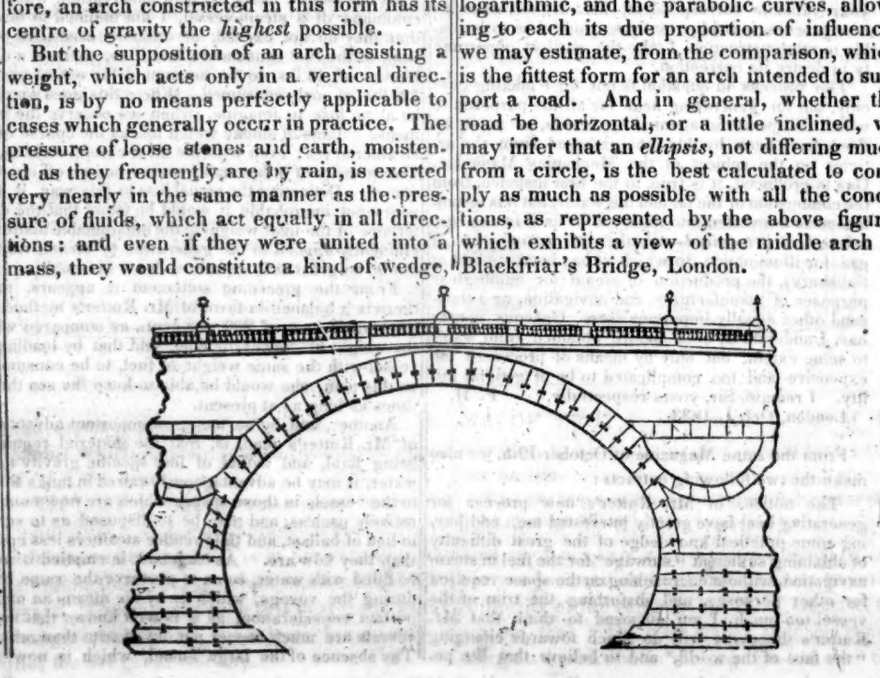
The *catenaria* is remarkable for this mechanical property. That a chain hanging in that curve has its centre of gravity *lower* than if it were disposed in any other line, its length continuing the same, and also the points from which it is suspended. Therefore, an arch constructed in this form has its centre of gravity the *highest* possible.

But the supposition of an arch resisting a weight, which acts only in a vertical direction, is by no means perfectly applicable to cases which generally occur in practice. The pressure of loose stones and earth, moistened as they frequently are by rain, is exerted very nearly in the same manner as the pressure of fluids, which act equally in all directions: and even if they were united into a mass, they would constitute a kind of wedge, and would thus produce a pressure of a similar nature, notwithstanding the precaution recommended by some authors, of making the surfaces of the arch-stones vertical and horizontal only. This precaution is, however, in all respects unnecessary, because the effect which it is intended to obviate is productive of no inconvenience, except that of exercising the skill of the architect. The effect of such a pressure only requires a greater curvature near the abutments, reducing the form nearly to that of an ellipsis, and allowing the arch to rise at first in a vertical direction.

A bridge must also be so calculated as to support itself without being in danger of falling by the defect of the lateral adhesion of its parts, and in order that it may in this respect be of equal strength throughout its depth at each point, must be proportional to the weight of the parts beyond it. This property particularly belongs to the curve denominated *logarithmic*, the length corresponding to the logarithm of the depth. If the strength were afforded by the arch stones only, this condition might be fulfilled by giving them the requisite thickness, independently of the general form of the arch: but the whole of the materials employed in the construction of the bridge must be considered as adding to the strength, and the magnitude of the adhesion as depending in a great measure on general outline.

We must examine in the next place what is the most advantageous form for supporting any weight which may occasionally be placed on the bridge, particularly at its weakest part, which is usually the middle. Supposing the depth at the summit of the arch at the abutments to be given, it may be reduced considerably, in the intermediate parts, without impairing the strength, and the outline may be composed of *parabolic arcs*, having their convexity turned towards each other. This remark also would be only applicable to the arch stones, if they afforded the whole strength of the bridge, but it must be extended in some measure to the whole of the materials forming it.

If, therefore, we combine together the curve best calculated for resisting the pressure of a fluid, which is nearly elliptical, the logarithmic, and the parabolic curves, allowing to each its due proportion of influence, we may estimate, from the comparison, which is the fittest form for an arch intended to support a road. And in general, whether the road be horizontal, or a little inclined, we may infer that an *ellipsis*, not differing much from a circle, is the best calculated to comply as much as possible with all the conditions, as represented by the above figure, which exhibits a view of the middle arch of Blackfriar's Bridge, London.



Babbage on the Economy of Manufactures.

(Concluded from page 809.)

"The many important facilities for the construction of machines and the manufacturing of commodities which we possess, are enjoyed by no other country; nor is it likely that any country can enjoy them to an equal extent for an indefinite period. *It is admitted by every one that our skill is unrivalled; the industry and power of our people unequalled; their ingenuity, as displayed in the continual improvement in machinery, and production of commodities, without parallel, and apparently without limit.* The freedom which, under our government, every man has, to use his capital, his labor, and his talents, in the manner most conducive to his interests, is an inestimable advantage; canals are cut, and railroads constructed, by the voluntary association of persons whose local knowledge enables them to place them in the most desirable situations; and these great advantages cannot exist under less free governments. These circumstances, when taken together, give such a decided superiority to our people, that no injurious rivalry, either in the construction of machinery or the manufacture of commodities, can reasonably be anticipated."

325. But even if it were desirable to prevent the exportation of a certain class of machinery, it appears abundantly evident, that, whilst the exportation of other kinds is allowed, it is impossible to prevent the forbidden kind from being smuggled out; and that, in point of fact, the additional risk had been well calculated by the smuggler.

326. It would appear, also, that there are circumstances which show that the immediate exportation of improved machinery is not quite so certain as has been assumed; and that the powerful principle of self-interest will urge the makers of machinery to push its extension in a different direction. When a great maker of machinery has contrived a new machine for any particular process, or has made some great improvement on those in common use, to whom will he naturally apply for the purpose of selling his new machines? Undoubtedly, in by far the majority of cases, he will communicate the circumstance to his nearest and best customers, those to whom he has immediate and personal access, and whose capability to fulfil any contract is best known to him. He will communicate with them, and offer to take their orders for the new machine; nor will he think of writing to inform foreign customers, so long as he finds the home demand sufficient to employ the whole force of his establishment. Thus, then, the machine-maker is himself interested in giving the first advantage of any new improvement to his own countrymen.

327. In point of fact, the machine-makers in London prefer home orders, and do usually charge an additional price to their foreign customers. Even the amount by which this preference is measured may be found in the evidence before the Committee on the Export of Machinery. It is differently estimated by various engineers, but appears to vary from five up to twenty-five per cent. on the amount of the order. The reasons for this are—1. If the machinery be complicated, one of their best men, well accustomed to the mode of work in the factory, must be sent out to put it up; and there is always a considerable chance of his having offers which will induce him to remain abroad. 2. If the work be of a more simple kind, and can be put up without an English workman, yet for the credit of the house which supplies it, and to prevent accidents which may occur from the want of sufficient instruction in those who use it, the parts are sometimes made stronger, and examined more attentively, than they would be for an English purchaser. Any defect or accident, also, would be attended with more expense to repair, if it occurred abroad, than in England.

328. The class of workmen who make machinery possess much more skill, and are paid much more highly, than that class who merely use it; and, if a free exportation of machinery were allowed, this higher and more valuable class would, undoubtedly, be greatly increased; for, notwithstanding the high price of wages, there is no country in which machinery can at this moment be made, either so well or so cheaply, as in England. We might, therefore, supply the whole world with machinery, at an evident advantage, both to ourselves and our customers. In Manchester, and in the surrounding district, many thousand men are employed wholly in making machinery, which gives employment to many hundred thousands who use it; but the period is not very remote, when the whole number of those who then *made use* of machinery, was not greater than the number of those who now *manufacture* machines. Hence, then, if England should ever become a great exporter of machinery, she would necessarily contain a large class of workmen, to whom skill would be indispensable, and, consequently, to whom high wages would be paid; and, although her manufacturers might probably be fewer in numbers, yet they would undoubtedly have the advantage of being the first to derive profit from improved machinery. Under such circumstances, any diminution in the demand for machinery would, in the first instance, be felt by a class much better able to meet it, than the class which now suffers upon every check in the consumption of manufactured goods; and the resulting misery would therefore assume a mitigated character.

329. It has been feared, that when other countries have purchased our machines, they will cease to demand new ones. The statement which has been given of the usual progress in the improvement of the machinery employed in any manufacture, and of the average time which elapses before it is superseded by such improvements, is a complete reply to this objection. If our customers did not adopt the new machinery contrived by us as soon as they could procure it, then our manufacturers would extend their establishments, and undersell their rivals in their own markets.

330. It may also be urged, that in each kind of machinery a maximum of perfection may be imagined, beyond which it is impossible to advance; and certainly the last advances are usually the smallest, when compared with those which precede them; but it should be observed, that these advances generally occur when the number of machines in employment is already large; and, consequently, their effects on the power producing are very considerable. But though it should be admitted that any individual species of machinery may arrive, after a long period, at a degree of perfection which would render farther improvement nearly hopeless, yet it is impossible to suppose that this can be the case with all kinds of mechanism. In fact, the limit of improvement is rarely approached, except in extensive branches of national manufactures, and the number of such branches is, even at present, very small.

331. Another argument in favor of the exportation of machinery is, that *it would facilitate the transfer of capital to any more advantageous mode of employment which might present itself.* If the exportation of machinery were permitted, there would doubtless arise a considerable demand; and, supposing any particular branch of our manufactures to cease to produce the average rate of profit, the loss to the capitalist would be much less if a market were opened in which he could sell his machinery to customers more favorably circumstanced for its employment. If, on the other hand, new improvements in machinery should be imagined, the manufacturer would be more readily enabled to carry them into effect, by having the foreign market open to him for the sale of his old machines. The fact that England can, notwithstanding her taxation, and her high rate of wages, undersell other nations, seems to be well established; and it appears to depend on the superior goodness and cheapness of those raw materials of machinery, the metals,—on the excellency of the tools,—and on the admirable arrangements of the domestic economy of our factories.

332. The different degrees of facility with which capital can be transferred from one mode of employment to another, has an important effect on the rate of profits in different trades and in different countries. Supposing every other cause which influences the rate of profit at any period, to act equally on capital employed in different occupations, yet the real rates of profit would soon alter, on account of the different degrees of loss in removing it from one mode of investment to another, or any variation in the action of those causes. This principle will appear more clearly by taking an example. Let two capitalists have embarked £10,000 each, in two trades: A in supplying a district with water, by means of a steam engine and iron pipes; B in manufacturing bobbin-net.

The capital of A will be expended in building a house and erecting a steam engine, which costs say £3000; and laying down iron pipes to supply his customers, costing, say £7000. The greatest part of this latter expense is payment for labor; and if the pipes were to be taken up, the damages to them would render them of little value, except as old metal, whilst the expense of removing them would be considerable. Let us, therefore, suppose, that if A were obliged to give up his trade, he could only realize £4000 by the sale of his stock. Let us suppose that B, by the sale of his bobbin-net factory, and machinery, could realize £8000. Farther, let us suppose the usual rate of interest made on the capital employed by each is the same, say 20 per cent.: then we have

	Capital invested.	Money which would arise from sale of machinery.	Annual rate of profit per cent.	Income.
Water-works - -	£10,000	£4,000	£20	£2,000
Bobbin-net Factory	10,000	8,000	20	2,000

Now, if, from competition, or any other causes, the rate of profit arising from water-works should fall to ten per cent., that circumstances would not cause a transfer of capital from water-works to bobbin-net making; because the reduced income from the water-works, £1000 per annum, would still be greater than that produced by investing £4000, (the whole sum arising from the sale of the materials of the water-works,) in a bobbin-net factory; which sum, at 20 per cent., would only yield £800 per annum. In fact, the rate of profit, arising from the water-works, must be reduced below eight per cent., before it would benefit the proprietor's income to remove his capital into the bobbin-net trade.

333. In any inquiry into the probability of the injury arising to our manufacturers from the competition of foreign countries, particular regard should be had to the facilities of transport, and to the existence in our own country of a mass of capital in roads, canals, machinery, &c., the greater portion of which may fairly be considered as having repaid the expense of its outlay, and also to the cheap rate at which the abundance of our fuel enables us to produce iron, the basis of almost all machinery. It has been justly remarked by M. de Villefosse, in the memoir before alluded to, that "Ce que l'on nomme en France, la *question du prix des fers*, est, a proprement parler, la *question du prix des bois*, et *la question des moyens de communications interieures par les routes, fleuves, rivieres et canaux*."

On referring to page 34 of the present volume, the price of iron in various countries in Europe has been stated; and it appears that, in England, it is produced at the least, and in France at the greatest expense. The length of the roads which cover England and Wales may be stated roughly at twenty thousand miles of turnpike, and one hundred thousand miles of road not turnpike. The internal water communication of England and France, as far as I have been able to collect information on the subject, may be stated as follows:—In France, navigable rivers, 4668 miles in length;

navigable canals, 915·5 miles; navigable canal in progress of execution, (1824,) 1388 miles. Total, 6971·5.* But if we reduce these numbers in the proportion of 3·7 to 1, which is the relative area of France as compared with England and Wales, then we shall have the following comparison:

	England.†		Portion of France equal in size to England and Wales.
		Miles.	*Miles.*
Navigable Rivers		1275.5	1261.6
Tidal Navigation‡		545.9	
Canals, direct	2023.5		
——, branch	150.6		
	2174.1	2174.1	247.4
Canals commenced		..	375.1
Total		3995.5	1884.1
Population in 1831		13,894,500	8,608,500

This comparison, between the internal communications of the two countries, is not offered as complete; nor is it a fair view, to contrast the wealthiest portion of one country with the whole of the other: but it is offered with the hope of inducing those who possess more extensive information on the subject, to supply the facts on which a better comparison may be instituted. The information to be added would consist of the number of miles in each country, of sea-coast,—of public roads,—of railroads,—of railroads on which locomotive engines are used.

334. One point of view, in which rapid modes of conveyance increase the power of a country, deserves attention. On the Manchester railroad, for example, above half a million of persons travel annually; and supposing each person to save only one hour in the time of transit, between Manchester and Liverpool, a saving of five hundred thousand hours, or of fifty thousand working days, of ten hours each, is effected. Now this is equivalent to an addition to the actual power of the country of one hundred and sixty-seven men, without increasing the quantity of food consumed; and it should also be remarked, that the time of the class of men thus supplied is far more valuable than that of mere laborers.

ON THE FUTURE PROSPECTS OF MANUFACTURES, AS CONNECTED WITH SCIENCE.

335. In reviewing the various processes which have been offered in the course of the present volume, as illustrations of those general principles which it has been its main object to support and establish, it is impossible not to perceive that the arts and manufactures of the country are intimately connected with the progress of the severer sciences; and that, as we advance in the career of improvement, every step requires, for its success, that this connection should be rendered more intimate.

The applied sciences derive their facts from experiment; but the reasonings, on which their chief utility depends, come more properly within the province of what is called abstract science. It has been shown, that the division of labor is no less applicable to mental productions than to those in which material bodies are concerned; and it follows, that the efforts for the improvement of its manufactures, which any country can make with the greatest probability of success, must arise from the combined exertions of all those most skilled in the theory, as well as in the practice of the art; each laboring in that department for which his natural capacity and acquired habits have rendered him most fit.

336. The profits arising from the successful application to practice of theoretical principles will, in most cases, amply reward, in a pecuniary sense, those by whom they are first employed: yet, even here, what has been stated with respect to *patents* will prove that there is room for considerable amendment in our legislative enactments: but the discovery of the great principles of nature demands a mind almost solely devoted to such investigations; and these, in the present state of science, frequently require costly apparatus, and exact an expense of time quite incompatible with professional avocations. It becomes, therefore, a fit subject for consideration, whether it would not be politic in a state to compensate for some of those privations to which the cultivators of the higher departments of science are exposed; and the best mode of effecting this compensation is a question which interests both the philosopher and the statesman. Such considerations appear to have had their just influence in other countries, where the pursuit of science is regarded as a profession, and where those who are successful are not shut out from almost every object of honorable ambition to which their fellow-countrymen may aspire. Having, however, already expressed some opinion upon these subjects in another publication,* I shall here content myself with referring to that work.

337. But it is of something beyond neglect, of which the science of England complains: for whilst in our own country, whose advancement in wealth and strength so peculiarly depends upon the aid of the sciences, no encouragement is held out to that which must ever precede their application to the practical purposes of life; whilst abstract science, the prolific parent of the useful arts—the unfailing guide in tracing to their remotest conclusions the natural laws which observations may have detected—is allowed by the state to entail upon its cultivators the sacrifice of all those personal interests which the exercise of the same powers of mind might command in any other pursuit: Englishmen are precluded from accepting those distinctions from the enlightened sovereigns of other countries, by which they might desire to express their respect for British science.†

There was, indeed, in our own country, one single position to which science, when concurring with independent fortune, might aspire, as conferring rank and station; an office deriving, in the estimation of the public, more than half its value from the commanding knowledge of its possessor; and it is extraordinary, that even that solitary dignity—that barony by tenure in the world of British science—the chair of the Royal Society,—should have been coveted for adventitious rank. It is more extraordinary, that a prince, distinguished by the liberal views he has invariably taken of public affairs—and eminent for his patronage of every institution calculated to alleviate those miseries from which, by his rank, he is himself exempted—who is stated by his friends to be the warm admirer of knowledge, and most anxious for its advancement,—should have been so imperfectly informed by those friends, as to have wrested from the head of Science the only civic wreath which could adorn its brow.‡

In the meanwhile the President may learn, through the only medium by which his elevated station admits approach, that those evils which were anticipated from his election have not proved to be imaginary, and that the advantages by some expected to result from it, have not yet become apparent. It may be right also to state, that whilst many of the inconveniences which have been experienced by the President of the Royal Society have resulted from the conduct of his own supporters, those who were compelled to differ from him have subsequently offered no vexatious opposition: they wait in patience, convinced that the force of truth must ultimately work its certain, though silent course; and not doubting that, when His Royal Highness is correctly informed, he will himself be among the first to be influenced by its power.

338. But younger institutions have arisen to supply the deficiencies of the old; and very recently a new combination, differing entirely from the older societies, promises to give additional steadiness to the future march of science. The "*British Association for the Promotion of Science*," which held its first meeting at York, in the year 1831, would have acted as a powerful ally, even if the Royal Society were all that it might be: but in the present state of that body, such an association is almost necessary for the purposes of science. The periodical assemblage of persons, pursuing the same or different branches of knowledge, always produces an excitement which is favorable to the developement of new ideas; whilst the long period of repose which succeeds, is advantageous for the prosecution of the reasonings or the experiments then suggested: and the recurrence of the meeting in the succeeding year will still stimulate the activity of the inquirer, by the hope of being then enabled to produce the successful result of his labors. Another advantage is, that such meetings bring together a much larger number of persons actively engaged in science, or placed in positions in which they can contribute to it, than can ever be found at the ordinary meetings of other societies, even in the most populous capitals; and combined efforts towards any particular object can thus be more easily arranged.

But perhaps the greatest benefit which will accrue to science from these assemblies, is the intercourse which they cannot fail to promote between the different classes of society. The man of science will derive practical information from the great manufacturers; the chemist will be indebted to the same source for substances which exist in such minute quantity as only to become visible in most extensive operations; and persons of wealth and property, resident in each neighborhood visited by these migratory assemblies, will derive greater advantages than either of those classes, from the real instruction they may procure respecting the produce and manufactures of their country, and the enlightened gratification which is ever attendant on the acquisition of knowledge.*

339. Thus, it may be expected that public opinion shall be brought to bear upon the world of science; for by this intercourse light will be thrown upon the characters of men, and the pretender and the charlatan will be driven into merited obscurity. Without the action of public opinion, any administrator, however anxious to countenance the pursuits of science, and however ready to reward by wealth and honors those whom they might think most eminent, would run the risk of acting like the blind man recently couched, who, having no mode of estimating degrees of distance, mistook the nearest and most insignificant for the largest objects in nature: it becomes, therefore, doubly important, that the man of science should mix with the world.

It is highly probable that in the next generation, the class of scientific men in England will

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* This statement is extracted and reduced from one in the Ravinet Dictionnaire Hydrographique, 2 vols. 8vo. Paris, 1824.

† I am indebted to E. Page, Esq of Speen, for that portion of this table which relates to the internal navigation of England: those only who have themselves collected statistical details, can be aware of the time and labor, of which the few lines in the above table are the result.

‡ The tidal navigation includes—the Thames from the mouth of the Medway,—the Severn from the Holmes,—the Trent from Trent Falls in the Humber,—the Mersey from Runcorn Gap.

* Reflections on the Decline of Science in England, and on some of its Causes. 8vo. 1830. Fellowes.

† The intentions of a Northern Sovereign, distinguished by his attachment to science, were some time ago defeated by information from his ambassador in London, of the existence of the regulation by which it was understood that the acceptance of such honor by British subjects is forbidden.

‡ The Duke of Sussex was proposed as President of the Royal Society, in opposition to the wish of the Council—in opposition to the public declaration of a body of Fellows, comprising the largest portion of those by whose labors the character of English science had been maintained. The aristocracy of rank and power, aided by such allies as it can always command, set itself in array against the prouder aristocracy of science. Out of about seven hundred members, only two hundred and thirty balloted; and the Duke of Sussex had a majority of EIGHT. Under such circumstances, it was, indeed, extraordinary that his Royal Highness should have condescended to accept the fruits of that doubtful and inauspicious victory.

The circumstances preceding and attending this singular contest have been most ably detailed in a pamphlet, entitled, "A Statement of the Circumstances connected with the late Election for the President of the Royal Society. 1831: printed by R. Taylor, Red Lion court, Fleet street." The whole tone of the tract is strikingly contrasted with that of the productions of some of those persons by whom it was his Royal Highness's misfortune to be supported.

* The advantages likely to arise from such an association have been so clearly stated in the address delivered by the Rev Mr. Vernon Harcourt, at its first meeting, that I would strongly recommend its perusal by all those who feel interested in the success of English science.—[Vide First Report of the British Association for the Advancement of Science. York, 1832.]

spring from a class of persons altogether different from that which has hitherto scantily supplied them. Requiring, for the success of their pursuits, previous education, leisure, and fortune, few are so likely to unite these essentials as the sons of our wealthy manufacturers, who, having been enriched by their own exertions, in a field connected with science, will be ambitious of having their children distinguished in its ranks. It must, however, be admitted, that this desire in the parents would acquire great additional intensity, if worldly honors occasionally followed successful efforts; and that the country would thus gain for science, talents which are frequently rendered useless by the unsuitable situations in which they are placed.

340. The discoveries of Iodine and Brome, two substances hitherto undecompounded, were both amongst the class of manufacturers, one being a maker of saltpetre at Paris, the other a manufacturing chemist at Marseilles: and the inventor of balloons filled with rarified air, was a paper manufacturer near Lyons. The descendants of Mongolfier, the first aerial traveller, still carry on the establishment of their progenitor, and still continue to combine great scientific knowledge with every department of the arts, to which the various branches of the family have applied themselves.

341. Chemical science may, in many instances, be of great importance to the manufacturer, as well as to the merchant. The quantity of Peruvian bark which is imported into Europe is very considerable; but chemistry has recently proved that a large portion of the bark itself is useless. The alkali Quinia, which has been extracted from it, possesses all the properties for which the bark is valuable, and only forty ounces of this substance, when in combination with sulphuric acid, can be extracted from a hundred pounds of the bark. In this instance, then, with every ton of useful matter, thirty-nine tons of rubbish are transported across the Atlantic.

At the present time, the greatest part of the sulphate of quinia used in this country is imported from France, where the low price of the alcohol, by which it is extracted from the bark, renders the process cheap; but it cannot be doubted, that when more settled forms of government shall have given security to capital, and when advancing civilization shall have spread over the states of Southern America, the alkaline medicine will be extracted from the woody fibres, by which its efficacy is almost lost, and that it will be exported in its most condensed form.

342. The aid of chemistry, in extracting and in concentrating substances used for human food, is of great use in distant voyages, where the space occupied by the stores must be economized with the greatest care. Thus, the essential oils supply the voyager with flavor —the concentrated and crystallized acids preserve his health—and alcohol, when sufficiently diluted, supplies the spirit necessary for his daily consumption.

343. When we reflect on the very small number of species of plants, compared with the multitude that are known to exist, which have hitherto been cultivated, and rendered useful to man, and when we apply the same observation to the animal world, and even to the mineral kingdom, the field that natural science opens to our view seems to be indeed unlimited. These productions of nature, numerous and varied as they are, may each, in some future day, become the basis of extensive manufactures, and give life, employment, and wealth, to millions of human beings. But the crude treasures perpetually exposed before our eyes contain within them other and more valuable principles. All these, in their innumerable combinations, which ages of labor and research can never exhaust, may be destined to furnish, in perpetual succession, new sources of our wealth and of our happiness. Science and knowledge are subject, in their extension and increase, to laws quite opposite to those which regulate the material world. Unlike the forces of molecular attraction, which cease at sensible distances, or that of gravity, which decreases rapidly with the increasing distance from the point of its origin, the farther we advance from the origin of our knowledge, the larger it becomes, and the greater power it bestows upon its cultivators, to add new fields to its dominions. Yet, does this continually and rapidly increasing power, instead of giving us any reason to anticipate the exhaustion of so fertile a field, place us at each advance on some higher eminence, from which the mind contemplates the past, and feels irresistibly convinced, that the whole, already gained, bears a constantly diminishing ratio to that which is contained within the still more rapidly expanding horizon of our knowledge.

But, if the knowledge of the chemical and physical properties of the bodies which surround us, as well as our acquaintance with the less tangible elements, light, electricity, and heat, which mysteriously modify or change their combinations, all concur to convince us of the same fact; we must remember that another and a higher science, itself still more boundless, is also advancing with a giant's stride, and having grasped the mightier masses of the universe, and reduced their wanderings to laws, has given to us, in its own condensed language, expressions, which are to the past as history, to the future as prophecy. It is the same science which is now preparing its fetters for the minutest atoms that nature has created: already it has nearly chained the ethereal fluid, and bound it in one harmonious system all the intricate and splendid phenomena of light. It is the science of *calculation*,—which becomes continually more necessary at each step of our progress, and which must ultimately govern the whole of the applications of science to the arts of life.

But perhaps a doubt may arise in the mind, whilst contemplating the continually increasing field of human knowledge, that the weak arm of man may want the physical force requisite to render that knowledge available. The experience of the past has stamped, with the indelible character of truth, the maxim, that "*Knowledge is power.*" It not merely gives to its votaries control over the mental faculties of their species, but is itself the generator of physical force. The discovery of the expansive power of steam, its condensation, and the doctrine of latent heat, has already added to the population of this small island, millions of hands. But the source of this power is not without limit, and the coal-mines of the world may ultimately be exhausted. Without adverting to the theory, that new formations of that mineral are now depositing under the sea, at the estuaries of some of our larger rivers; without anticipating the application of other fluids requiring a less supply of caloric than water: we may remark that the sea itself offers a perennial source of power hitherto almost unapplied. The tides, twice in each day, raise a vast mass of water, which might be made available for driving machinery. But supposing heat still to remain necessary when the exhausted state of our coal-fields renders it expensive: long before that period arrives, other methods will probably have been invented for producing it. In some districts, there are springs of hot water, which have flowed for centuries unchanged in temperature. In many parts of the island of Ischia, by deepening the sources of the hot springs but a few feet, the water boils: and there can be little doubt that, by boring a short distance, steam of high pressure would issue from the orifice.*

In Iceland, the sources of heat are still more plentiful; and their proximity to large masses of ice seems almost to point out the future destiny of that island. The ice of its glaciers may enable its inhabitants to liquify the gases with the least expenditure of mechanical force: and the heat of its volcanoes may supply the power necessary for their condensation. Thus, in a future age, *power* may become the staple commodity of the Icelanders, and of the inhabitants of other volcanic districts; and possibly the very process by which they will procure this article of exchange for the luxuries of happier climates may, in some measure, tame the tremendous element which occasionally devastates this province.

344. Perhaps to the sober eye of inductive philosophy, these anticipations of the future may appear too faintly connected with the history of the past. When time shall have revealed the future progress of our race, those laws which are now obscurely indicated will then become distinctly apparent; and it may possibly be found that the dominion of mind over the material world advances with an ever-accelerating force.

Even now, the imprisoned winds which the earliest poet made the Grecian warrior bear for the protection of his fragile bark; or those which, in more modern times, the Lapland wizards sold to the deluded sailors; these, the unreal creations of fancy or of fraud, called, at the command of science, from their shadowy existence, obey a holier spell: and the unruly masters of the poet and the seer become the obedient slaves of civilized man.

Nor has the wild imagination of the satirist been quite unrivalled by the realities of after years: as if in mockery of the College of Laputa, light almost solar has been extracted from the refuse of fish; fire has been sifted by the lamp of Davy; and machinery has been taught arithmetic instead of poetry.

345. In whatever light we examine the triumphs and achievements of our species over the creation submitted to its power, we explore new sources of wonder. But if science has called into real existence the visions of the poet —if the accumulating knowledge of ages has blunted the sharpest, and distanced the loftiest of the shafts of the satirist, the philosopher has conferred on the moralist an obligation of surpassing weight.

In unveiling to him the living miracles which teem in rich exuberance around the minutest atom, as well as throughout the largest masses of ever-active matter, he has placed before him resistless evidence of immeasurable design. Surrounded by every form of animate and inanimate existence, the sun of science has yet penetrated but through the outer fold of Nature's majestic robe; but if the philosopher were required to separate, from amongst those countless evidences of creative power, one being, the masterpiece of its skill; and from that being to select one gift, the choicest of all the attributes of life; turning within his own breast, and conscious of those powers which have subjugated to his race the external world, and of those higher powers by which he has subjugated to himself that creative faculty which aids his faltering conceptions of a deity, —the humble worshipper at the altar of truth would pronounce that being,—man: that endowment,—human reason.

But however large the interval that separates the lowest from the highest of those sentient beings which inhabit our planet, all the results of observation, enlightened by all the reasonings of the philosopher, combine to render it probable that, in the vast extent of creation, the proudest attribute of our race is but, perchance, the lowest step in the gradation of intellectual existence. For, since every portion of our own material globe, and every animated being it supports, afford, on more scrutinizing inquiry, more perfect evidence of design, it would indeed be most unphilosophical to believe that those sister spheres, glowing with light and heat, radiant from the same central source— and that the members of those kindred systems, almost lost in the remoteness of space, and perceptible only from the countless multi-

* In 1828, the author of these pages visited Ischia, with a Committee of the Royal Academy of Naples, deputed to examine the temperature and chemical constitution of the springs in that island. During the first few days, several springs, which had been represented in the instructions as under the boiling temperature, were found, on deepening the excavations, to rise to the boiling point.

tude of their congregated globes—should each be no more than a floating chaos of unformed matter; or, being all the work of the same Almighty Architect, that no living eye should be gladdened by their forms of beauty, that no intellectual being should expand its faculties in deciphering their laws.

The following curious account of a new and important invention by Capt. Ericsson, is taken from the London Times of the 9th November. The subject is appears to have attracted considerable attention in England, and it will probably, if it should succeed according to the expectations of the inventor, produce important changes in the propelling power for machinery, travelling, &c.

We shall look for further accounts upon the subject with much interest, and lay them, when they are received, promptly before the public.

Ericsson's Caloric Engine.—Various attempts have been made to construct engines founded on the principle of the expansion of atmospheric air by heat, but these attempts have still remained without practical success. The caloric engine invented by Capt. Ericsson, a large working model of which we have seen in vigorous operation, seems to promise results of a very different kind. Air and steam must now engage in a desperate and probably a deadly struggle for the mastery. If the sanguine, and we think not unreasonable, hopes of the inventor be realized, steam has seen its best days.

The principle of the engine is founded on the well known property of fluids, that they transmit their pressure equally in all directions. It consists of two cylinders of unequal diameters, the area of the pistons of the one being double that of the other. These cylinders are connected together by means of a series of pipes, called a regenerator. If air be condensed in these cylinders, it is obvious that the superior pressure exerted on the piston of the large cylinder will vanquish the pressure on the small one, and motion will take place till the larger piston has reached the top of the cylinder, whilst the small one has been pushed to the bottom. Here all motion would cease, if heated condensed air were not allowed to enter above the large piston, and below the small one, so as to depress the large one to the bottom of the cylinder, and raise the smaller one to the top. But this being done by sliding valves, exactly as in the steam engine, the motion is constantly kept up. On this principle, then, we could obviously have an air engine, which would perform its operations by the sudden heating and cooling of condensed atmospheric air. But this is not the principle which distinguishes the caloric engine from others of the same class. The marked difference lies in this—that the same heat is made to circulate through the engine and perform the same duty over and over again, instead of being thrown into a cold condenser or into the atmosphere as so much waste fuel.

The regenerator consists of a number of pipes, having numerous discs of metal placed within them, to make the air circulate in eddies, and either deposite its heat in the pipes, or receive it from them, according to the difference of temperature. These pipes are inclosed in a long cylinder of sheet iron, which has also discs of metal so arranged that the air, passing along the outside of the pipes, may also travel in a circuitous route, and deposit its heat, or receive it, according to circumstances.

The heated air, after having done its duty in the large cylinder, is made to circulate through the regenerator, and deposit a very large quantity of its caloric before it reaches the cold cylinder. The cold air from the small cylinder is at the same time passing along the interior of the pipes to the tubes above the furnace, and is thus carrying back the *same* caloric to do the same work over again. But though we have only mentioned atmospheric air as the fluid actually employed, it is obvious that any other fluid, whether seriform or liquid, may be used in the same manner. But a simple statement of numerical facts, furnished us by the engineer himself, will be of more value in turning the attention of the public to this invention than any general observations which we can possibly make. The engine actually constructed has two cylinders of 18 inches stroke each, the one being 14 inches in diameter, the other 10 1-4 inches. The working pressure is 35 lbs. above that of the atmosphere. The fly-wheel performs 56 revolutions in a minute. The break-wheel is two feet in diameter, and loaded with a weight of 5,200 lbs. The power of the engine is calculated to be equal to five horses. The regenerator has seven tubes about seven feet long and two inches diameter. The engine requires only 2 lbs. of coal per hour for the power of one horse, and the whole heat which is actually lost out of this quantity, or not returned by the regenerator, is only 3 lbs. per hour; so that the other parts are lost by radiation, &c., which may be much diminished in an engine on a larger scale, and by surrounding certain parts by imperfect conductors.

Smoky Chimneys.—Among the many sufferings arising from the limited diffusion of science, that from smoky fire-places is by no means the least. Independent of the direct inconvenience of smoke in the room, dangerous colds are often taken from hoisted windows or opened doors. What a beautiful picture of comfort is presented on entering, in cold December day an apartment, the inmates of which have red and tearful eyes, and stand or sit shivering in currents of cold air! Count Rumford observes that the general fault of common chimneys is the greatness of the opening at the throat. The following is a condensed view of some of his rules:

Fig. 1.

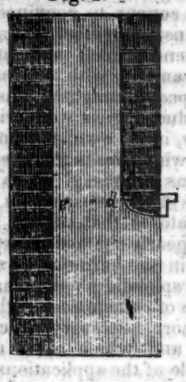
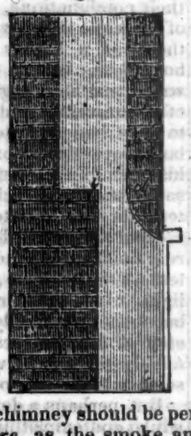
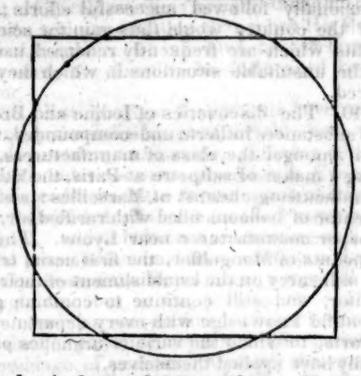


Fig. 2.



"1. The *throat* of the chimney should be perpendicularly over *the fire*, as the smoke and hot vapor which rise from a fire naturally tend *upwards*. By the *throat* of a chimney is meant the lower extremity of its canal, where it unites with the upper part of its open fireplace. 2. The nearer the throat of a chimney is to the fire the stronger will be its *draught*, and the less danger of its smoking; since smoke rises in consequence of its rarefaction by heat, and the heat is greater nearer the fire than at a greater distance from it. But the draught of a chimney may be too strong, so as to consume the fuel too rapidly; and, therefore, a due medium must be fixed upon, according to circumstances. 3. That *four inches* is the proper width to be given to the throat, reckoning across from the top of the breast of the chimney, or the inside of the mantle to the back of the chimney; and even in large halls, where great fires are kept up, this width should never be increased beyond 4½ or 5 inches. 4. The width given to the back of the chimney should be about *one-third* of the width of the opening of the fireplace in front. In a room of middling size, *thirteen inches* is a good size for the width of the back, and 3 times 13 or 39 inches for the width of the opening of the fireplace in front. 5. The angle made by the back of the fireplace and the sides of it, or covings, should be 135°, which is the best position they can have for throwing heat into the room. 6. The back of the chimney should always be built *perfectly upright*. 7. Where the throat of the chimney has an end, that is to say, where it enters into the lower part of the open canal of the chimney, *there* the three walls which form the two covings and the back of the fireplace should *all end abruptly*, without any slope, which will render it more difficult for any wind from above to force its way through the narrow passage of the throat of the chimney. The back and covings should rise 5 or 6 inches higher than the breast of the chimney. 8. The current of air, which, passing under the mantle, gets into the chimney, should be made *gradually to bend its way upwards*; by which means it will unite *quietly* with the ascending current of smoke. This is effected with the greatest ease and certainty, merely by *rounding off* the breast of the chimney, or back part of the mantle, instead of leaving it flat or full of holes and corners. Fig. 1 shows the section of a chimney on the common construction, in which *d e* is the throat. Fig. 2 shows a section of the same chimney altered and improved, in which *d i* is the reduced throat, four inches in the direction *d i*, and thirteen inches in a line parallel to the mantle."



Mechanical Quadrature of the Circle. By William Baddeley. [From the London Mechanics' Magazine.]

Sir,—The accompanying diagram exhibits a mechanical quadrature of the circle effected by Mr. Heaton, which I believe to be quite original; the rule thereby obtained is sufficiently accurate for all practical purposes. From a piece of carefully rolled sheet brass was cut out a circle 1·9 inches diameter, and a square of 1·7 inches. On weighing them they were found to be of exactly the same weight, which proves that as each are of the same thickness, the surfaces must also be precisely similar. The rule, therefore, is that the square is to the circle as 17 is to 19. Mr. Heaton made a number of experiments before he hit upon the right measurement, which he has at length determined with as much accuracy as the case will admit of.

I am, sir, yours, very respectfully,

William Baddeley.

London, Aug. 19, 1833.

Mechanics in China.—It is said there are in China, 25,000 shoemakers; 15,000 weavers; 16,000 carpenters and cabinet-makers; and 7,000 lapidaries, or cutters of precious stones.

SUMMARY.

Naval Lyceum.—This new association is exciting the interest of our citizens, and we have to day seen a most beautiful volume of colored engravings representing the naval battles of Great Britain from 1793 to 1817, which, with other books, was presented by one of our public spirited merchants to the Library of the Lyceum.

United States Naval Lyceum.—At an adjourned meeting of the U. S. Naval Lyceum held on Wednesday the 18th December 1833,

It was unanimously resolved that all Passed Midshipmen of the U. S. Navy be invited to become members of the Society, and that all Midshipmen not passed, be invited to avail themselves of the benefits of the Institution, by having free access to the Library, papers, &c.

The Lyceum also return their thanks for valuable donations to General Fleming, Professor Anthon, N. Prime Esq. Messrs. N. and T. White, Charles De Behr, T. and W. White and P. S. Chauncey.

At a special meeting of the United States Naval Lyceum, held on Monday, the 23d inst., it was unanimously Resolved, That the thanks of this Society be presented to the following distinguished gentlemen of the city of New York, New Jersey, and the Navy, for their liberal donations, and valued patronage extended towards the Institution:

Messrs. Goodhue & Co.	Peter Harmony, Esq.
Charles King, Esq.	James G. King, Esq.
Capt. Wm. Bolton, U. S. N.	Charles A. Davis, Esq.
Messrs. G. G. & S. Howland	George Dearborn, Esq.
Messrs. D. Appleton & Son	Wm. Wood, Esq.
Samuel Swartwout, Esq.,	John Travers, Esq.
and the officers and clerks of the Custom House.	John Lang, Esq.
	Rev. Wm. Patten,

The Editors of the New York Standard, Courier & Enquirer, Gazette, Evening Star, American, and Constellation.

Brooklyn Naval Lyceum.—This institute of the brave is receiving many tributes, and bids fair to become one of the first literary *bazaars* in the United States. Among the number of donors we observe the names of General Fleming, Doctor Hosack, Washington Irving, John Pintard, and Doctor Milnor.

This office continues to receive any donations for the Lyceum.—[Courier and Enquirer.]

Danby's sublime picture of the Opening of the Sixth Seal will be removed almost immediately after New Year. We therefore advise those who have not seen it, to profit by the intermediate time. To those strangers whom the Christmas festivities may assemble in the city, we particularly recommend this painting.

Com. Elliot has presented to the Mariner's Church of Charleston, a baptismal vase, formed out of the timber of the Frigate Constitution so celebrated in our history.

Very Exemplary Damages.—Mr. James Currin and Miss Smith, who were sometime since thrown from a gig and seriously injured, brought their suits against the town of Lowell in which the road was situated. The case has been tried within a few days before the Supreme Court of Massachusetts now sitting at Cambridge, and Mr. Currin recovered a verdict of $4000, and Miss Smith one of $3000.

A Temperance Match.—*Col. Haskett challenged for* 3000 *miles.*—A match for this distance has been entered into between a gentleman of Georgia and Col. Haskett. The match will come off on the first of June, over the road between Taunton and Boston. The challenger is to eat per day, as a *minimum* allowance, 1 lb. beef, 1 lb. bread, and to drink 3 glasses of 4th proof brandy and a half pint Madeira. The parties are to be on the road at the day, or half forfeit. The challenger set forth the bet at $5000 to $20,000, but the money matters are to be adjusted in Carolina. The Col. is to eat per day his old allowance of bread and water. We shall have an opportunity of seeing the relative virtue of the bread and water and beef and rum. The agent of the challenged arrived a few days ago, and leaves to examine the road next week, and have it measured.—[Boston Centinel.]

Lotteries.—"Who will not rejoice (says the Gazette of this morning) to learn, that after the end of this month, no Lottery Tickets can be sold in this State? and that yesterday afternoon the last Lottery was Drawn.

The Packet ship Ontario, Capt. Sebor, from London, arrived yesterday afternoon, and ran into Quarantine, where she was detained by the boarding physician. She has on board three cabin, and one hundred steerage passengers.—[Standard.]

According to the Gazette, more than 50 cases of small pox exist on board.

A steamboat arrived last evening from Poughkeepsie, with the mail and passengers from Albany, who came down to that place the greater part of the way in sleighs, there being plenty of snow above Rhinebeck.—[Ibid.]

Five lighters came up from Rockaway beach yesterday morning, loaded with four thousand bars of iron, about two hundred sacks of salt, and a few other articles, being part of the cargo of the British barque Atlantic, from Liverpool, that was cast away at that place on the 9th inst. The wreck went to pieces on Tuesday, during the storm. The fragments were sold for $73.—[Ibid.]

We are pleased to learn that the Government have finally purchased and received a title for the ten feet of ground adjoining their property in Pine street, preparatory to the immediate commencement of the work of building the Custom House, on the site so long since, and so judiciously selected by the Secretary of the Treasury.

We congratulate the merchants on the removal of this last obstacle, in doing which they have had an opportunity of again manifesting the liberality and public spirit which have actuated them in this business throughout. We learn that the price which the Government paid for this ten feet of ground, was what the Commissioners under the peculiar circumstances of the case, with great liberality, estimated it to be worth, viz. 17,500 dollars. The owner however, declined to sell it at that price, demanded and received 20,500. The difference of $3000 was paid to the owner by a gentleman in behalf of the merchants—who, we understand, have promptly and with their accustomed liberality agreed to refund this sum.—[Evening Post.]

[*From the Cherokee Phœnix, Nov. 23d.*]

The National Council convened at Red Clay, on the 14th Oct., and after the meeting of the two houses, and a full attendance of the members from all the Districts of the Nation, the Principal Chief delivered his speech to the General Council, which will be found on our first page. Among the various acts of this Council and of general interest to the Cherokees, is the appointment of a delegation, to proceed to the Congress of the United States, pursuant to the Report of the Select Committee which follows the speech of the Chief. The Council then proceeded to the consideration of various matters which came before them, and after the appointment of the following delegates, Messrs. John Ross, Richard Taylor, Daniel McCoy, Hare Conrad, and John Timson; the Council adjourned on the 1st Nov. to meet again on the second Monday of Oct. 1834.

Earthquake.—By advice from the Pacific, we learn that the towns of Arica and Tacua, in Peru, were almost destroyed by an Earthquake on the 18th of September. We have received no particulars.—[Jour. of Com.]

The Gale of last week.—The Georgetown (Delaware) Luminary, thus speaks of this gale, which was most severe on Monday night. The case of the black man forced to choose between his own destruction with that of all his family, or safety to himself at their expense, was a very hard one.

The tide rose several feet above the Delaware Breakwater, sweeping off several houses that had been erected thereon and carrying them completely over the beach, by which several lives were lost, beside five or six dead bodies that have come ashore on the beach since the storm. There are said to be *eleven* vessels on the beach, among which is a ship and two brigs, all of which lay under the Breakwater in supposed security, but the tide rising above it, they were entirely at the mercy of the tempest. What extent of damage they sustained, or number of lives lost, we have not been able to ascertain. Two vessels, we understand, were lost in Indian River, one belonging to Mr. Miers Burton, commanded by Haslet Streets, a colored man, who was drowned, together with all on board. The vessel sunk with 600 bushels of Corn on board. The other vessel belonged to a Mr. Vent, Captain Morris—whether the crew were lost or not, we have not ascertained. Among the distress which has come to our knowledge from those residing adjacent to the shore, is that of a black family residing in Slaughter neck, consisting of a man, his wife, grandmother and five children, all of whom were drowned but the man. His statement is truly distressing; he could not peak for several hours after his arrival at the nearest house, about a mile and a quarter distant from his residence. Upon the water breaking into the house, he and his family became alarmed, got out of their beds and left the house without even dressing themselves. He said he first took up his grandmother and proceeded some distance through the water, which was nearly breast high, when he found his wife was about to give out, he left his grandmother and four children to die, and took up his wife and one child, but had proceeded only a short distance, when he felt himself sinking, and shook them off to die, (oh inhuman!) when he succeeded with great difficulty in reaching the upland, having only strength left to crawl to the nearest house. Considerable loss has been sustained in Cattle and Sheep, several farmers losing their entire stock. The furnace at Millsborough was put out on Saturday night, this being the third time that the fire has been thus put out.

We understand that the Delaware Breakwater will have to be raised six feet higher than was anticipated, and before they will again venture to erect buildings on it.

NEW-YORK AMERICAN.

DECEMBER 21, 23, 24, 25, 26, 28—1833.

LITERARY NOTICES.

We commence our Review to-day, as we propose to do hereafter, with one of the excellent letters of our travelling correspondent H. His last, described *Braddock's field:* the present one spreads tangibly before the eye, Pittsburg, and all its prosperous industry.

No. VIII.

Pittsburg, Nov. 8.

There is no place in the Western country, as Judge Baldwin observed, in his address before the Mechanics' Institution of Pittsburgh, "which can more justly boast of its small beginnings, its rapid but solid growth, and its future greatness," than this. It is about seventy years since General Washington, then a young fellow of two and twenty, was despatched by Governor Dinwiddie of Virginia, to the French commander on Le Bœuf, (near Erie,) to demand that he should desist from aggression upon the British frontier. The young officer, upon his return down the Alleghany upon a raft made with tomahawks, was wrecked with a single Indian attendant, upon an island near the present city of Pittsburgh. The situation of the point of land, formed by "the forks of the Ohio," at once caught his military eye; and crossing on the ice in the morning, he examined the position with sufficient minuteness to impress his commander with its importance. The spot was soon after taken possession of by a small colonial force, which in 1754 was easily dispersed by the formidable descent of the French under Contrecœur. He came with a thousand men at his back, and floated various munitions of war, among which were eighteen pieces of cannon, in three hundred and sixty canoes, down the Alleghany. The blow was struck which commenced the old French war, that lost France all her possessions east of the Mississippi. Contrecœur, entrenched himself upon the spot, and the bloody annals of Fort *Du Quesne* received their first notoriety from this bold invader.

Thirty years afterwards, the place now become known as fort Pitt, began to assume commercial importance, from the Indian fur trade then carried on with vigor from this point. An increase of population ensued, the extensive coal beds in the vicinity began to be appreciated; they indicated the prodigious manufacturing resources of the rising town of Pittsburgh. The adjacent country became rapidly populated and it was soon the agricultural depot for the rich region on this side of the Alleganies. The genius of Fulton matured at once the rising fortunes of Pittsburgh and gave her a market for her overflowing productions.

Situated two thousand miles from New Orleans, by the aid of steam she supplies the whole of the intermediate region with hardware, machinery, and cutlery.* But it is not for this manufacture alone, that Pittsburgh, though often called the "Birmingham of America," is celebrated. Her extensive Glassworks are well known even beyond the Alleganies, and this fragile production of her workshops, finds its way alike to the borders of Lake Erie and of the Atlantic and may be met in the elegant mansions of Baltimore and the remote shantees of the Arkansaw.

*Bloom iron, I am told, is brought hither for manufacture, from the forges on the Juniata, from Tennessee, Kentucky, and Missouri, and contracts are frequently made for $38 per Ton to take the blooms at St. Louis and return them rolled iron.

The timber trade, is another great feature in the business relations of Pittsburgh; the boards and scantling measured within the city in 1830 amounted to more than five millions of feet; of this a great deal was floated down the branches of the Allegany river from the south western counties of New York. The romantic hills of Chatauque county, supply not a few of the stately trunks which, after being hewn into shape at Pittsburgh subsequently float the varied products of Northern industry, through many a stranger climate to the rich markets of Louisiana. You will not wonder, therefore, that the freight exported from Pittsburgh in 1830 amounted to upwards of 18,000 tons, its imports for the same year being more than 14,000 tons. The city is now, with the adjacent village of Allegany town, and Lawrenceville on the Allegany, and Birmingham and Manchester on the Monongahela, the third town in population, wealth, and importance, in the Mississippi valley. Next to its admirable situation, the flourishing condition of the place, is no doubt to be mainly attributed to the inexhaustible quantities of fine bituminous coal, which may be had for the digging in all the adjacent hills. Pittsburgh is however, indebted to the character of her early settlers for her present eminence; they were chiefly mechanics, enterprising, industrious, practical minded men; the improvements they commenced, were based upon utility, and every path of trade they struck out, led to some immediate, and tangible good. The result shows itself, in one of the most substantial, and flourishing, but least elegant cities on the continent. The site of the town, I have already described to you as one of the most beautiful, that can be imagined! The fault is to be attributed entirely to the manner in which it is laid out, for the streets though by no means wide, are well and substantially built upon with brick; and a species of yellow free-stone found in the vicinity is coming into use, which, for elegance as a building material, is not surpassed by marble itself. The great defect in the town, is the total want of public squares, and indeed of an agreeable promenade of any kind; this is the more remarkable, I might almost say provoking, as Pittsburgh boasts of one spot, which, if converted into a public place, would, from the view it commands, be unrivalled by any thing of the kind in the Union, unless it be the Battery of New York. I allude to a triangular piece of ground, at the confluence of the two rivers, at the end of the town. It is the site of the old Forts, and commands the first view of the Ohio, and the finest of its waters I have yet seen; the prospect I have described to you in a former letter. Had but the ancient fortifications been preserved, this would have been one of the most interesting spots upon the Continent; of Fort Du Quesne there remains now but a small mound, containing perhaps a couple of loads of earth; Fort Pitt may be more easily traced, part of three bastions about breast high, stand within different private enclosures, and a piece of the curtain which, within a few years, was in complete preservation, may still be discovered among the piles of lumber in a steam sawmill yard. The commandant's quarters, a steep roofed brick dwelling, in the form of a pentagon, is, however, the only perfect remnant of these old military structures. I expected to have seen the magazine of the Fort, which I was told was an admirable piece of masonry, and still endured in the shape of a Porter cellar, but upon arriving at the spot where it had stood but a few weeks before, a pile of rough stones was all that we could discover. In a country like ours where so few antiquities meet the eye, it is melancholy to see these interesting remnants, thus destroyed, and the very landmarks where they stood effaced for ever. Occasionally too, the works of which every vestige is thus painfully obliterated, were, especially when erected by the French, of a peculiarly striking character. The French engineers who first introduced the art of fortification into this country, were of the school of Vauban, and the enduring monuments they raised were not less noble proofs of their skill, than were the sites selected, of their high military discernment.

There is yet another place in Pittsburgh which at some future day should be appropriated as a public square; a triangular bluff about one hundred feet high stretches like a huge promontory far into the town, and overlooks the whole place. The Pittsburgers, however, I fear are more bent upon increasing their "father's store," than on beautifying the favored spot in which they dwell, and it requires all the cordial hospitality of the place, to reconcile a stranger to the few city improvements he sees going forward, in a community so preeminent for its individual enterprize. I wish we could lend them our 'inproving' corporation for a few weeks, they would be really of service here, and could easily be spared at home; they might too, learn more than one thing of the Pittsburghers, and especially how to supply the city with pure water; we have it here in the greatest abundance. The water is pumped up from the Alleghany, by a steam-engine, into a large open basin, situated on an eminence known as Grant's Hill, from the signal defeat of that rash but gallant officer at its base, during the old French war. From this ample reservoir, pipes conduct the fluid to every part of the city. A large Gothic Cathedral is now about to be erected near the water-works.

You remember Grant's fight, as described by Hall, in his beautiful Western Sketches. Grant bivouacked beneath the hill now called after him, and ordering his reveille to beat at dawn; the French and Indians charged upon him to the sound of his own trumpets, and cut his troops to pieces. His force, I believe, consisted chiefly of Highlanders. The skeleton of a young officer with gold in his pocket, and marks of rank about his person, was turned up in a field not far distant, a few years since. A Western poet, of whose existence I first became aware through a file of the Pittsburg Gazette, (for which, with many interesting facts relating to the adjacent country, I am indebted to Mr. Craig, the Editor,) has commemorated the incident in some verses, among which are the following simple lines:

"One Highland officer that bloody day
Retreated up the Alleghany side,
Wounded, and faint, he missed his tangled way,
And near its waters laid him down and died.

'Twas in a furrow of a sandy swell
Which overlooks the clear and pebbled wave,
Shrouded in leaves, none found him where he fell,
And mouldering nature gave the youth a grave.

"Last year a plough passed o'er the quiet spot,
And brought to light frail vestiges of him,
Whose unknown fate perhaps is not forgot,
And fills with horror yet a sister's dream.

On the side of the hill is a place, still pointed out as 'Grant's grave.' I know not why it should be thus designated, however; for I believe that the worthy Colonel, who afterwards served in the British army during the Revolution, never returned to lay his bones in a spot, where the spirits of his rashly sacrificed soldiers might have made him uneasy in his grave. There is a more authentic tomb on the western bank of the Alleghany: it is the last resting-place of an Indian, who, as tradition avers, seeing 'Helen's beauty in a brow of Egypt,' shot himself for love! Poor fellow! he must have been serious! for, as Hudibras saith,

"He that hangs and beats out brains,
The devil's in him if he feigns."

The walks and rides in the environs of Pittsburgh, are rendered interesting by a variety of objects, besides the fine scenery through which they lead. A description of the Pennsylvania Canal, which flows on an acqueduct over the Alleghany, and passing through a tunnel of a few yards in length, locks into the Monongahela, on the opposite side of the city, would furnish you with no newer ideas than a description of any other Canal. The Nunnery which is also one of the Lions of the neighhood, I have not hitherto had an opportunity to visit, and "Braddock's field" you have already in a letter by itself; so having now a tolerable idea of the town, with its compact brick dwellings, dingy with coal-smoke; its natural wharves, where the Ohio rises 25 feet; its gravelly banks, lined with steamboats and river-craft, and bustling with business operations upon the most extensive scale, you must follow me in my ride of this morning along the Monongahela.

The fog and coal-smoke together, rendered the atmosphere so thick, even after crossing the bridge over the river to a straggling village opposite, that I verily believe it was only the dazzling sparkle of a pair of queen-like eyes, marshalling me through the gloom, that enabled me to ascend the opposite height with safety. Leaving the rest of the party far behind, I followed their beautiful and high-spirited owner up a winding path, where our horses, after sinking to their fetlocks in the sand, would slip half a pace backward at every step, and gained at last an elevation nearly five hundred feet above the level of the river, where, to my surprise, instead of a sudden descent upon the opposite side, the eminence continued rising in a succession of fertile fields, until the last green slope was terminated by a distant wood. We rode along the edge of the precipice for a mile or two, and from the state of the atmosphere on the side towards the town, you can conceive nothing more singular than the effect of the scene below. Imagine yourself standing on Weehawk height, with your own city brought immediately beneath your feet, the whole landscape bright and clear above, and a cloud so impervious below, that not an object can be discerned at five yards' distance. The gulf seems unfathomable. The hoarse jar of machinery comes upon the ear like the groans of a nether world; and the lurid flame, which ever and anon shoots from some furnace athwart the gloom, shows like the penal element itself. But now the noon-day sun has pierced into that murky glen,—the fog begins to rise—a gilded spire glances here and there in the broad sunshine, and some tall headland stands greenly out from the silver veil that wraps its base; the banner from yonder arsenal floats gaily forth in the warm air; and as the flaky mist rolls more rapidly up the river, begins to stream upon the freshening breeze. The rivers themselves can now be traced far away, with many a dewy island stealing out, one by one, upon their bosom. Beneath, a bustling city seems as if it had sprung at once to life, while the quiet farm-houses slowly appear upon the sleeping fields beyond.

This single view is worth a journey to Pittsburg.

I took an opportunity, while a lady of the party stopped to visit a pensioner in a cottage by the road-side, to examine a coal-pit just beneath the brow of the hill. Dismounting on a small platform some two hundred feet above the river, from which a railway empties the coal into the *coke* kilns upon its bank, and the freight boats upon the shore, I entered an aperture in the rock about six feet in height, and four in breadth. A guide preceded me with a candle and after penetrating under his escort a few hundred yards, I turned aside to explore some of the adjacent shafts; they lie like the streets of one main avenue; the veins of a grand artery, which, after winding through the body of the hill finds its way again to the light, a half a mile distant. In one of these cavernous passages, in a ledge of the rock lay a sleeping man, the water trickling from the black walls around, was the only sound to disturb his slumbers; a long wicked candle stuck in a crevice above his head, shining over thickly matted locks, and features begrimmed with coal-dust, revealed a figure of gigantic mould. The mattock on which his ponderous arm reposed told that it was only a miner at his noonday nap, but he might have been mistaken by one coming suddenly upon his singular place of repose, for a slumbering Titan, who, though pent within

such narrow confines, might yet shake the mountain piled upon him to its base.

Our route now, after leading still farther along the height, commanding at every step some new view of the town, and the adjacent country, with the three rivers seaming its bosom, struck at last into a fine wood, and then descending suddenly into a romantic dell, we followed a small stream which soon led us back to the Ohio.—Here again might be traced a display of French taste which when the fabric was entire must have been exceedingly beautiful. It was the remains of a mill dam constructed by the officers of Fort Du Quesne, according to the most approved rules of the time, like a perfect fortification; a part of the curtain, with traces of some of the bastions, yet reward the eye of the curious. At the mouth of the glen we paused to look at a salt factory, and then crossing a bridge over the brook, we passed by a steel factory, and several coke kilns, along the base of the cliff from the summit of which I had so much admired the scene below an hour ago.

The embouchure of the Monongahela was at hand, and stepping aboard of a small horse boat at the point where it loses itself in the Ohio, I soon terminated on the opposite side one of the most delightful rides I can recollect ever to have taken. H.

THE SPIRIT OF LIFE; a Poem, pronounced before the Franklin Society of Brown University: by WILLIS GAYLORD CLARK. Philadelphia: KEY & BIDDLE.—Mr. Clark has written some pretty poetry; and among the fugitive pieces bound up with the main poem in this handsome little volume, there are some, and particularly the Prayer of Mary Queen of Scots, superior in merit and inspiration to that which gives its name to the book. The "spirit of life," universal as the writer insists it is, and vivifying as is its influence, is not very perceptible in the poem which aims to describe its operations and powers. There is manifestly too much haste, and too little of the *vivida vis* in this attempt.

LECTURES ON GENERAL LITERATURE, POETRY, &c. By JAMES MONTGOMERY. Author of 'The World Before the Flood:' constituting Vol. LXIV of HARPERS' FAMILY LIBRARY: New York.—It is not more than a week or two ago since we made a beautiful extract from these Lectures, in which the eloquent and enthusiastic poet asserted the superiority of his art over the sister art of Sculpture; and proved it by comparing the statue of "the Dying Gladiator" with Byron's admirable description of it in Childe Harold. The favorable impression made by that extract will, we think, be realized by the whole book, which is full of burning thoughts and fine and generous views of the ennobling influence of poetry. These Lectures were originally delivered at the *Royal Institution* in London, and are now published enlarged and carefully revised. To these are added, "A Retrospect of Literature," and a "View of Modern English Literature." From the Retrospect, we make an extract that strikes us as quite original:

The Permanence of Words.—An eloquent, but extravagant, writer has hazarded the assertion, that "words are the only things that last for ever."*—Nor is this merely a splendid saying, or a startling paradox, that may be qualified by explanation into commonplace; but with respect to man, and his works on earth, it is literally true. Temples and palaces, amphitheatres and catacombs—monuments of power, and magnificence, and skill, to perpetuate the memory, and preserve even the ashes, of those who lived in past ages—must, in the revolutions of mundane events, not only perish themselves by violence or decay, but the very dust in which they perished be so scattered as to leave no trace of their material existence behind. There is no security beyond the passing moment for the most permanent, or the most precious of these; they are as much in jeopardy as ever, after having escaped the changes and chances of thousands of years. An earthquake may suddenly ingulf the pyramids of Egypt, and leave the sand of the desert as blank as the tide would have left it on the seashore. A hammer in the hand of an idiot may break to pieces the Apollo Belvidere, or the Venus de'Medici, which are scarcely less worshipped as miracles of art in our day than they were by idolaters of old as representatives of deities.

Looking abroad over the whole world, after the lapse of nearly six thousand years, what have we of the past but the words in which its history is recorded? What besides a few mouldering and brittle ruins, which time is imperceptibly touching down into dust,—what, besides these, remains of the glory, the grandeur, the intelligence, the supremacy of the Grecian republics, or the empire of Rome? Nothing but the words of poets, historians, philosophers, and orators, who being dead yet speak, and in their immortal works still maintain their dominion over inferior minds through all posterity. And these intellectual sovereigns not only govern our spirits from the tomb by the power of their thoughts, but their very voices are heard by our living ears in the accents of their mother tongues. The beauty, the eloquence, and art of these collocations of sounds and syllables, the learned alone can appreciate, and that only (in some cases) after long, intense, and laborious investigation; but as thought can be made to transmigrate from one body of words into another, even through all the languages of the earth, without losing what may be called its personal identity,—the great minds of antiquity continue to hold their ascendency over the opinions, manners, characters, institutions, and events of all ages and nations through which their posthumous compositions have found way, and been made the earliest subjects of study, the highest standards of morals, and the most perfect examples of taste, to the master-minds in every state of civilized society. In this respect, the "words" of inspired prophets and apostles among the Jews, and those of gifted writers among the ancient gentiles, may truly be said to "last for ever."

Words are the vehicles by which thought is made visible to the eye, audible to the ear, and intelligible to the mind of another; they are the palpable forms of ideas, without which these would be intangible as the spirit that conceives or the breath that would utter them. And of such influence is speech or writing, as the conductor of thought, that, though all words do not "last for ever," and it is well for the peace of the world, and the happiness of individuals, that they do not,—yet even here every word has its date and its effect; so that with the tongue or the pen we are continually doing good or evil to ourselves or our neighbors. On a single phrase expressed in anger or affection, in levity or seriousness, the whole progress of a human spirit through life—perhaps even to eternity—may be changed from the direction which it was pursuing, whether right or wrong. For in nothing is the power and indestructibility of words more signally exemplified than in small compositions, such as stories, essays, parables, songs, proverbs, and all the minor and more exquisite forms of composition. It is a fact, not obvious perhaps, but capable of perfect proof, that knowledge, in all eras which have been distinguished as enlightened, has been propagated more by tracts than by volumes.—We need but appeal, in evidence of this, to the state of learning in our own land at the present day, when all classes of people are more or less instructed.—On this point I shall have a future opportunity of expatiating, and will therefore, at present, offer only two examples of the permanence of words, involving sacred or important truth, of equal value and application, in all periods and countries, and among all people to whom they may be delivered.

In the youth of the Roman commonwealth, during a quarrel between the patricians and plebeians, when the latter had separated themselves from the former, on the plea that they would no longer labour to maintain the unproductive class in indolent luxury, Menenius Agrippa, by the well-known fable of a schism in the human body, in which the limbs mutinied against the stomach, brought the seceders to a sense of their duty and interest, and reconciled a feud which, had it been further inflamed, might have destroyed the state, and turned the history of the world itself thenceforward into an entirely new channel, by interrupting the tide of events which were carrying Rome to the summit of dominion. The lesson which that sagacious patriot taught to his countrymen and contemporaries, he taught to all generations to come. His fable has already, by more than a thousand years, survived the empire which it rescued from premature destruction.

The other instance of a small form of words, in which dwells not an immortal only, but a divine spirit, is that prayer which our Saviour taught his disciples. How many millions and millions of times has that prayer been preferred by Christians of all denominations! So wide, indeed, is the sound thereof gone forth, that daily, and almost without intermission, from the ends of the earth, and afar off upon the sea, it is ascending to Heaven like incense and a pure offering; nor needs it the gift of prophecy to foretell, that though "heaven and earth shall pass away," these words of our blessed Lord "shall not pass away," till every petition in it has been answered—till the kingdom of God shall come, and his will be done in earth as it is in heaven.

EXPERIMENTS AND OBSERVATIONS ON THE GASTRIC JUICE, AND THE PHYSIOLOGY OF DIGESTION. By WM. BEAUMONT, M. D. Surgeon of the United States Army. New York: G. & C. & H. CARVILL.—This is a very remarkable publication; being nothing more nor less than the record of the observations made during a series of years, by a skilful medical man, upon the *visible* action of the stomach of a living man. The case was that of a Canadian *voyageur*, who, at the age of eighteen, received accidentally the charge of a musket loaded with duck-shot, in his side, he being within a yard of the muzzle. The wound perforated the stomach. Dr. B. was called to the wounded man—succeeded in saving his life, restoring his health; and yet the orifice in the stomach remained for years unclosed. Here, then, an opportunity was presented of watching Nature in her most secret operations, of surprising her in her own laboratory, and of ascertaining, in the living man, the processes by which life is maintained; for, when we cease to digest, we cease to live. The result is highly curious and instructive, and cannot fail, we should think, of producing important changes and improvements in the art of medicine. *Spallanzani*, and others, had made experiments upon the powers of the gastric juice, by administering to animals food of different kinds, in perforated metal balls; but all of these fail of certainty and interest, in comparison with those instituted and so faithfully followed up by Dr. Beaumont, and ultimately by the Surgeon General of the Army, Dr. Lovell.

THE LAW GLOSSARY: by THOMAS TAYLOR, Albany: W. A. GOULD. New York: GOULD, BANKS & Co.—This cannot be otherwise than a useful work in our country, where the dead languages are not as familiar as, for the improvement and purification of both taste and language, we wish they were, but where lawyers do much abound. It is a selection and translation of the various and numerous sentences, phrases, and maxims, spread through the old law books, and many of which are still preserved and in use at this day, in Greek, Latin, French, Saxon, &c. The author has, in our judgment, well fulfilled his task. His translations are easy and accurate, so far as we have looked through his pages; and the historical notes in the Appendix are some of them alike curious and interesting. The volume is dedicated, by permission, to Chief Justice Savage; and must, we think, be well received by the profession, and still more by those not of it, but who yet in the conflicting claims of a busy world, are often brought into contact with it.

(Concluded from page 831.)

But it is not at all necessary for the usefulness of the suspension railway, that it should be in every respect as capable of enduring heavy loads as the railway now most usually constructed. The important question is, whether, taking into consideration the expense of its construction, the cost of transportation upon it will be less than upon an ordinary road. If this point is established as it has been, beyond all doubt, its importance is manifest. There are many parts of the United States where the increase of population and of business calls for greater facilities of communication; yet the travel is not sufficient to support the enormous expense of the double iron railway. There are other sections so rugged and uneven, that whatever might be the amount of travel, it could not pay the expense of embankments, excavations, and other works necessary for attaining the level required for the road. In all such cases the suspension road, on account of its comparatively trifling expense, can be used to great advantage. The average cost of a suspension railroad, built with prudence and economy, extending over a country, the surface of which presents no peculiar advantages or disadvantages, is about one quarter of that of the double track iron road now in use, and this difference is increased in proportion as the country, over which the road is to be constructed, is more rugged and uneven than usual. Now suppose that the suspension road is only capable of bearing one third of the momentum which the other road can bear, (and this is certainly a greater allowance than it would be necessary to make in practice,) yet the cost being one fourth that of the other, and its power one third, it follows, of course, that the suspension road would be much the most economical.

In a new country, therefore, where means are limited, it must be of immense advantage. Its merits have not hitherto been generally known. It has been but very little used in England, probably on account of the high price of timber, and on this side of the Atlantic we have been slow to adopt suggestions that have not been proved and tested by experiment. But it is now getting into more extensive favor in those parts of the country where timber is abundant. It will, no doubt, in a short time, prove a most important method of inland transportation.

☞ We owe an apology to our friends, for not issuing these numbers on Saturday, as promised. They have been delayed two days longer, in order that the Index and Title Page might accompany them, to make the work complete for the year.

December 30, 1833.